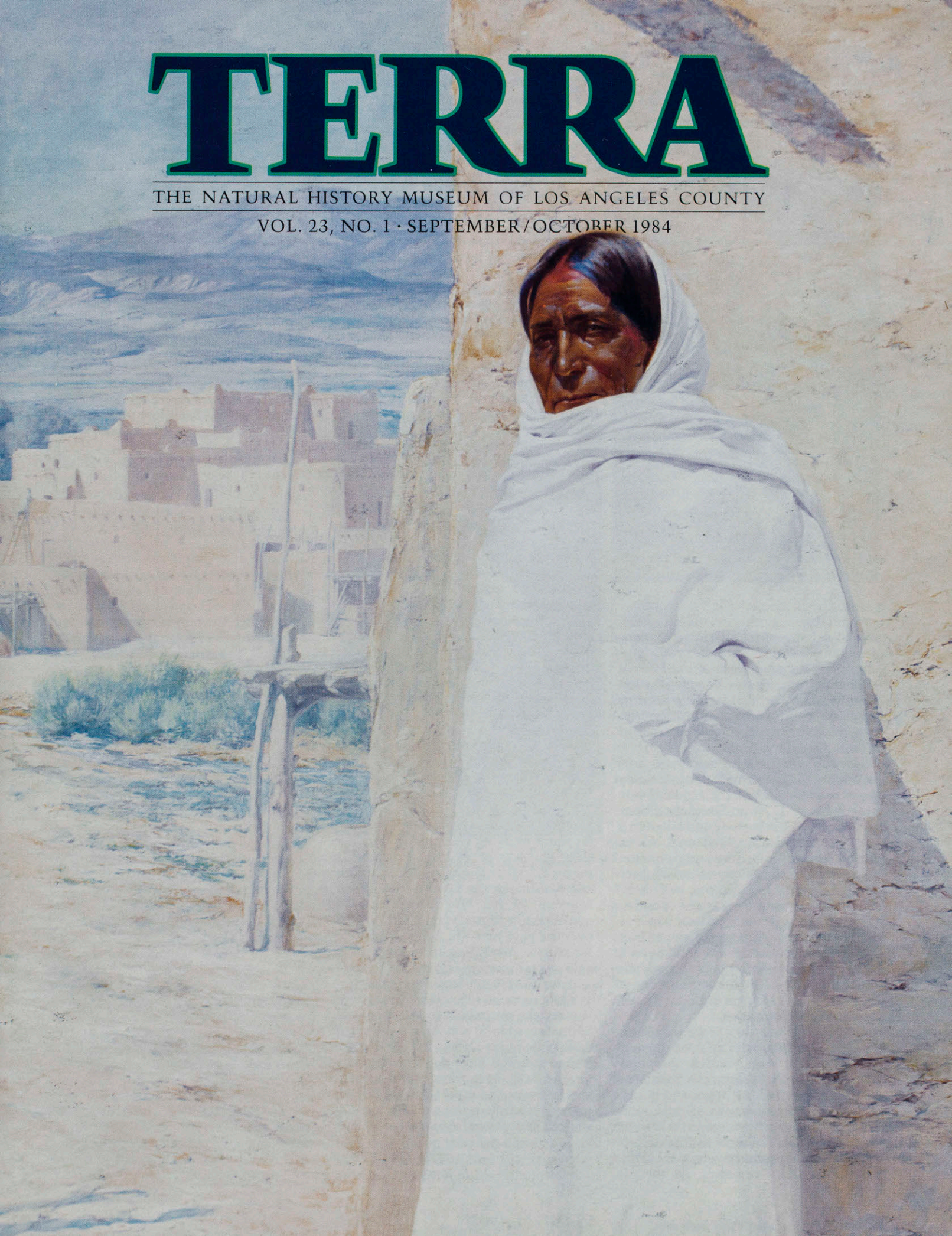
TERRA

THE NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY
VOL. 23, NO. 1 · SEPTEMBER/OCTOBER 1984



FROM THE DIRECTOR

Dr. Craig C. Black

In the past few months, there have been a number of additions to the museum's curatorial and programming staff.

The National Endowment for the Humanities has provided funding for three new staff members to assist in the curation of the History Division's collections. Dr. Guy Bishop, formerly a resident of Utah and an employee of the IRS, joins the museum staff as Assistant Curator of Social History. Dr. Bishop received his Ph.D. from Southern Illinois University at Carbondale and taught history in Nebraska. Dr. William L. Cumiford, a lecturer in history and consultant to the Oral History Program at California State University, Fullerton, will serve as Assistant Curator for the Business and Industrial History Section. Dr. Errol Stevens, former director of the Indiana Guide Project, joins the museum as Curator of Historic Records at the Seaver Center for Western History. Dr. Stevens received his Ph.D. from the University of Indiana at Bloomington.

The NEH has also provided much-needed curatorial staff in Anthropology. Dr. Margaret Ann Hardin, Associate Curator of Anthropology, is a graduate of the University of Michigan and holds a Ph.D. in Anthropology from the University of Chicago. Most recently she has worked for the Pueblo of Zuni as exhibit curator for a major traveling exhibit of traditional Zuni ceramics. At the museum Dr. Hardin will continue her studies of Zuni and Tarascan ceramics and will be involved with the planning of the new Hall of Western North American Indians.

Nicole Bouché has joined the Research Library staff as Librarian. She will be responsible for cataloging the collection of the Seaver Center for Western History. Ms. Bouché has master's degrees in both Library Science and History from the University of California, Berkeley, and was formerly employed by the Library of the Institute of Transportation Studies at Berkeley.

Two scientific sections of the museum have also added permanent staff to manage our growing collections. Dr. Richard Frieson has recently joined the Mammology Section as Collections Manager. He holds a Ph.D. in Systematic Mammology from the University of Southern California and most recently was Assistant Professor of Biology for the University of Redlands in Redlands, California. Dr. Frieson will be responsible for the curation of smaller mammals.

Charles Clifton Coney, most recently an instructor of biology for the University of Southern Carolina, Conway, joins the museum as Collections Manager for the Malacology Section. He will be responsible for the taxonomic arrangement of molluscans. Currently he is involved in research on comparative microanatomy of bivalve gill structure.

The museum is delighted and fortunate to have two highly experienced professionals managing our Public Relations and Membership Departments. Marie Whelan, with 30 years of experience in Public Relations as an administrator and writer, joins the museum as the new Public Relations Manager. Ms. Whelan's articles on culture and travel have appeared in such major publications as *Travel and Leisure* and *Westways*. Ms. Whelan is a member of the Public Relations Society of America. Marilyn Anne (Lynn) Seno has joined the museum staff as Director of Membership. She was previously Assistant Director of Development, Membership, and Systems at the Los Angeles County Museum of Art where she increased membership and revenue significantly over the past year. Ms. Seno will employ innovative marketing techniques to enable our museum to expand membership and provide greater benefits to members.

Without creative and dedicated professionals, the museum's collections would be inaccessible to scholars and the general public alike. During the coming year, I hope you will have the opportunity, at our Annual Open House and at other special events, to meet the fine staff who serve you through their research, exhibits, and educational programs.

CRAIG C. BLACK
Director

TERRA

THE MEMBERS' MAGAZINE
OF THE NATURAL HISTORY MUSEUM
OF LOS ANGELES COUNTY
AND THE PAGE MUSEUM
OF LA BREA DISCOVERIES

VOL. 23, NO. 1 · SEPTEMBER/OCTOBER 1984

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Detail of Gerald Cassidy's *Cui Bono?* (Who Benefits?), a life-size canvas, ca. 1913, of a Taos Pueblo man standing before his town. 93½ by 48 inches. Collection of the Museum of Fine Arts, Museum of New Mexico.

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The Center Space:

PUEBLO INDIAN ARCHITECTURE

by JEROME IOWA

The link between culture and architecture is at least twofold: first, built forms reflect the values, aspirations, history, and technology of their creators, and second, buildings influence the lives and social patterns of their inhabitants, often for many generations. Although it may function largely at a subconscious level, architecture is a lasting symbol and shaper of cultural self-image.

The social iconography of the designed environment is nowhere more apparent than in the Indian pueblos of the American Southwest. When Spanish explorers first arrived in the New World, a few of these ancient towns had already been inhabited for 500 years, and their survival into the twentieth century is a testament to both cultural perseverance and the ability to adapt and change. The pueblos, as seen today in northern New Mexico and Arizona, represent one of the most distinguished and enduring achievements of native folk construction in this country; they are a unique and precious national cultural resource.

The Pueblo Indians were so named by the Spaniards because they lived in permanent towns of, to the Spaniards, coherent urban character. Ben Wittick's photograph of Zuni Pueblo in about 1890 (page 00) reveals the basic tenets of the pueblo design tradition: massive blocks of attached, flat-roofed houses, built of stone, timbers, and earth, terracing down toward a central space or *plaza*, which is both the "living room" of the town and the setting for sacred dances and ceremonials. In building such towns, the Indians very consciously expressed their cultural values: the towns can be viewed as deliberate formal responses to specific philosophical and functional questions and ideas. As such, they are very different from the routine built American landscape. Compare, for example, the social collectivism manifested in the traditional attached house groups of the pueblos with the focus on the individualized nuclear family expressed in an American suburban housing tract, with its thin slices of space between houses articulating both architectural and interpersonal zones of isolation.

Jerome Iowa

The T-shaped doorway is a signature feature of Classic period Anasazi construction. This fine example is from twelfth-century Pueblo Bonito. 81½ inches high, 75½ inches wide. The T's symbolic meaning seems to have been lost with the centuries, for it is no longer prevalent in Pueblo art and architecture.

The inhabitants of a pueblo are almost all related, either by kinship or clan affiliation, and their collective ceremonials foster the well-being of the earth and its people and success in the pursuit of hunting and agriculture—challenging undertakings in the high desert zones of the Southwest. Building, like every other aspect of traditional life, is considered a sacred activity, producing an artifact that is a lasting prayer (perhaps a strange idea to most of us, but worth considering, for the whole town is analogous to what we might relegate exclusively to church or other ostensibly religious buildings). And indeed, the prayer of construction has lasted, for most of the pueblos are between 300 and 800 years old. The specific language of the prayer, as manifest in the design tradition, has also endured: new towns built by the Hopi as late as 1910 still conformed in large part to the ancient pattern.

At the same time, there has always been evolution in the general character and particular detail of the pueblo formula. But this evolution seems to be accelerating rapidly today. In the last few decades, there has been an intensified erosion of the traditional lifeway and its embodied architecture. As a result, some of the thirty pueblos in northern New Mexico and Arizona are falling into decay; others are being maintained true to their historic character, and still others have changed sufficiently to be virtually indistinguishable from almost any Western American town. Clearly, a variety of forces are working at once to preserve—and eradicate—the traditional pueblo, both architecturally and culturally.

Interest in this accelerated change has generated some good studies of the pueblos in recent years by anthropologists and archaeologists. However, people of the pueblos are private and restrained, and it requires perseverance to understand the essence of their architecture, its changing meaning, and to explore meaningful strategies for ensuring the survival and adaptation of their culture insofar as it is expressed through the built environment.

Several years ago, I was asked by the Design Arts section of the National Endowment for the Arts to assess the prospects for a major exhibition on Pueblo Indian architecture. The goal of the exhibit was to celebrate not only the ap-

(Continued on page 8)

View in Zuni: The Five Terraces,
photographed by Ben Wittick around 1890. Historic architecture in the nineteenth-century Indian pueblos reveals the characteristics of its ancient Anasazi heritage; massive terraced blocks of attached houses, centering on the void space of a central plaza. Courtesy of the Museum of New Mexico.

Mark Nohl

By the late nineteenth and early twentieth centuries, pottery figures and miniature houses were being made for an emerging tourist market. These two models, representing a house block, were made by Taos potter Jerri Track in 1982. "House Block" (left), 11½ inches. Loan from the artist.

North House at Taos Pueblo, *1981. Taos is among the Southwest's Indian Pueblos that have found ways to carry their architectural and cultural heritage into the present day.*

Jerome Iowa

Art Taylor

Walpi, *a vast tryptich painting by James Harrill, 1982, illustrates one of the most dramatic of the citadel towns at Hopi. 72 by 144 inches overall. Loan from the artist.*

Pink Pueblo: Canyon del Muerto, *casein on paper painting by Douglas Johnson, 1981. Johnson's minutely detailed images suggest the mystery and magic of the Southwest's ancient cultures to modern non-Indian observers. 7 by 10 inches. Gift of the artist to the Museum of Fine Arts, Museum of New Mexico.*

Mark Nohl

Pueblo Indian arts of all sorts demonstrate an extraordinary endurance and adaptivity—one of the themes explored in The Center Space. From right to left: A Zuni cow kachina from the late nineteenth century; 15 inches high; collection of the Millicent Rogers Museum, Taos. A Zuni silver and turquoise "petite-point" squash blossom necklace, ca. 1930; 24 inches long; loan from the Zuni Man, Ru Baron, Santa Fe. Zuni inlaid shell pendant, ca. 1940 but closely resembling thousand-year-old pieces; 3¾ inches in diameter; collection of the Millicent Rogers Museum. A prehistoric-style pottery vessel from the late nineteenth century by famous Hopi potter Nampeyo; 19½ inches in diameter, 12 inches high; collection of the Museum of New Mexico. A Chacoan Anasazi jet and shell necklace, ca. A.D. 1050—the one prehistoric piece in the grouping; 168 inches long; collection of the School of American Research, Santa Fe.

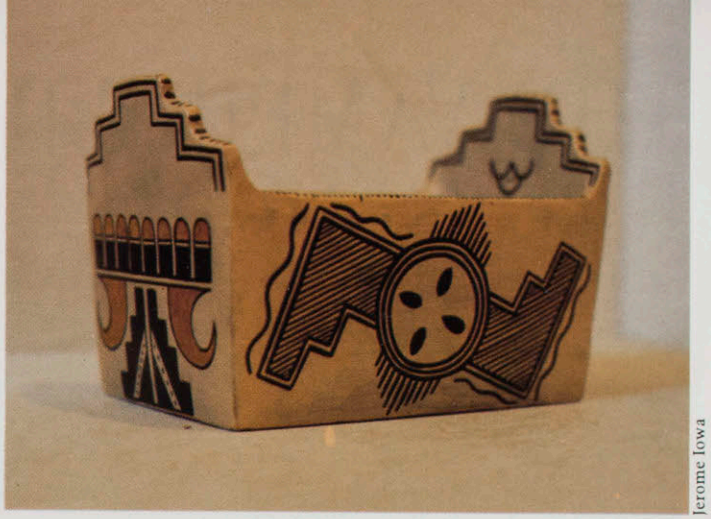
(Continued from page 3)

pearance of pueblo buildings but the culture from which they come; to document an ancient building tradition but also to explore ways in which the utilitarian tool of design is helping to shape the future today. The result is The Center Space: Pueblo Indian Architecture.

A diverse team of consultants—including Indians and non-Indians, designers and museum professionals, and anthropologists and archaeologists—was involved in planning the exhibit. It was decided very early on that the exhibition would be different from the routine architecture show, which customarily features many drawings, some photographs, and maybe a model or two, in that The Center Space would place an emphasis on three-dimensional pieces and deliver a sense of the cultural context from which the artifacts emerged. The formal organization of The Center Space was to reflect structural concepts of the pueblo world itself. Importantly, the exhibit could not present any one contemporary design philosophy as universally accepted by the Indian community: despite a common urban morphology and cultural heritage, today's Puebloan lifestyles vary widely, as do the means by which the ancient architectural traditions are revisted in the modern world.

Museums and individuals all across the United States possess beautiful material of potential relevance to the exhibit, but artifacts are nowhere abundant. Some things are too fragile to travel; others, such as a single room or an entire peublo—surely the best document of pueblo architecture—are just too heavy. Actual fragments of early buildings are so rare outside of the pueblos themselves that a fair proportion of the known pieces could be collected together for the first time in The Center Space.

Other artifacts less obviously related to architecture are included in the exhibit to invoke a sense of cultural context. These objects suggest trends in various Pueblo arts in general over time. And because all Indian art forms are closely interwoven, and symbolically derivative of the native belief system, it seems appropriate to consider a pottery bowl and a town plan, for example, together. Another artifact—an adobe brick—is featured in its own exhibition case, although it may be deemed profoundly mundane by some viewers. It seemed logical to include this fundamental architectural component of many of the pueblos in the exhibit; if the brick and a priceless pottery jar by Nampeyo are made of the same sacred earth, why shouldn't brick and jar be equally



Jerome Iowa

Art Taylor

Interior of Hooker's House, *Sichimovi (Hopi), 1902, photograph attributed to Adam Clark Vroman. The sensitive images in the Vroman collection give a view into Pueblo home life at the turn of the century. Collection of the Natural History Museum of Los Angeles County.*

Top: Pottery ceremonial dish made in 1922 by Maria Martinez shows the perseverance of prehistory's stepped terrace motif in the contour of the edge. 10 by 5 by 7 inches. Collection of the Museum of New Mexico. Bottom: In addition to being artfully documented, Pueblo architecture has also been the subject of an endless array of roadside curios and "kitsch" takeoffs, such as this toaster cover.

"enshrined" in display? The result is the interpretive presentation of the essential Puebloan concept of *sacred totality* as well as an ironic commentary on the conventional wisdom regarding what is Art and what is just plain dirt.

The Center Space also examines the way in which non-Indian people have perceived and portrayed Pueblo architecture. Outsiders' recorded images of the towns proved to be diverse and often astonishing in their beauty. Witness Gerald Cassidy's monumental canvas *Cui Bono?* (Who Benefits?), showing a robed Taos Pueblo man standing before his town, radiant with inaccessible authority under the high desert sun. At the same time, there is considerable humor in the lunacy of other pieces, such as "The Edible Pueblo," a cake in the shape of a houseblock, complete with marshmallow ovens and chewing gum ladders!

The Center Space is an exhibition about architecture and town planning, about the interface of built form and culture, and about the Southwest's Indian pueblos in particular. The exhibit also infers—like the artifacts themselves—the process of its creation in that it examines various people's ways of perceiving architecture. This intentional eclecticism, born through the diverse perspectives of consultants in our planning process, yields understanding more through "atmospheres" than through hard and pat answers. And this approach to the subject has already proven to be rather controversial in the exhibit's initial installation in New Mexico.

I hope that The Center Space: Pueblo Indian Architecture, which opens at the Natural History Museum on October 9, will provide museum visitors with new insights into the ways of experiencing architecture and show that there are vast dimensions of meaning in buildings beyond their outward appearance.

Jerome Iowa is a graduate of Cornell University and is twice an Eidlitz Architectural Fellow, twice a Fellow of the National Endowment for the Arts, and the recipient of a first prize award for solar design from HUD. In addition to professional practice, he has taught and published in the fields of architectural theory and history, preservation, and community-access design. He was principal organizer and project director for The Center Space, which originated at the Museum of New Mexico in Santa Fe. Dr. Thomas Chavez, History Associate Director for the Museum of New Mexico was project coordinator for the exhibit when it appeared at Santa Fe's Palace of the Governors in 1983 and 1984.

THE VAMPIRE DOLPHINS OF THE RIO COLORADO: *FABLE OR FACT*

by E. BARHAM

In my time as a sea-going biologist, I've seen some strange things. Things that are not to be found in text books and are unreported in the scientific literature. Usually, these are strictly chance observations with no opportunity for verification. Still, as in the case of the alleged "vampire dolphin," some one-time observations are worth telling and should be on record. My brief encounter with this beast dates back some seven years. Names, places, events fade; even the best intentioned memory is fallible. I had best write it down now as accurately as possible.

How I happened to visit the Rio Colorado on the isolated extreme northeast tip of Costa Rica is really a story within a story. It was in the late spring of 1977, during the National Marine Fisheries Service's aerial survey of the porpoise stocks impacted by the tuna purse seine fishery. Working out of various aerodromes spaced along the Latin American coast we had been making a series of lengthy flights over the eastern tropical Pacific scouting porpoise herds. Modern aircraft are not designed for the required long, low altitude flights at slow speeds, and our old Navy surplus, P2V patrol bomber repeatedly developed problems that put us far behind schedule. Finally, with the survey about half done, the port engine failed as we were circling over a porpoise herd in the Gulf of Panama, and rather than chance flying back over the mountains to San Jose, Costa Rica, we limped into the Canal Zone Howard Air Force Base. After listening to the dour prognosis of a flight engineer, we mercifully put that ill-fated piece of machinery out of its misery and flew Pan Am back to Los Angeles International.

Even though there would now be time gaps in our data, it was important to finish that survey. Observers on the purse seiners could score the numbers of porpoise accidentally killed in the fishing process, but without an estimate of the population sizes, projections of the impact on the status of the stocks would have little validity. We badly needed a plane with special capabilities, and time was against us.

The Cousteau Society came to our rescue. Communications with their business manager, Tom Horton, and Phillipe Cousteau indicated that their vintage PBY, Catalina amphibian was undergoing rework at the Coopesa facility near San Jose, Costa Rica, the exact location where the survey had been interrupted. (Aside from living through it, this was the only piece of luck we had during the entire expedition.) Phillipe loved that plane, and he was anxious to prove its worth as a scientific tool as well as a camera platform. Further, the society wanted to make a contribution to our porpoise work.

On the Acapulco tarmac (left to right) Mike Sullivan, Phillipe Cousteau, and Guy Jouas ponder the problems of the PBY's overheating engine.

Two weeks later we were back in San Jose shaking down the plane. In addition to Phillipe and myself, the group consisted of Michael Sullivan (Copilot), Guy Jouas (Flight Engineer), and four porpoise observers from the Southwest Fisheries Center, La Jolla, California: Dr. Joseph Powers, Charles Oliver, Richard Charter, and William Walker. We made a short checkout flight, then ferried north to Acapulco, Mexico. The next morning, topped off with gas, the old PBY rumbled the full length of that huge strip and staggered off into a rosy dawn on what was planned as a 2,500 mile, 17-hour flight. It was not to be. As the landing gear was retracted a hydraulic line failed, one wheel came up, the other sagged half down. To make matters worse, the port engine was overheating, and we could not generate enough power to gain altitude. Circling over a coconut plantation, we dumped gas, manually forced the gear back down, and returned to the strip. The hydraulic line was a quick fix, but all our efforts to solve the hot engine problem were futile. Our only alternative was to ferry back to San Jose where an extra engine was stored. I left my colleagues to la dolce vita on government per diem, and flew back with Phillipe's crew.

It would take a few days for the Coopesa mechanics to hang the new engine. Phillipe suggested that in the interim we charter a plane and fly over to a famous tarpon fishing lodge near Barra del Colorado, the Casa Mar. The managers, Bill and Linda Barnes, were old friends and would make us welcome, even on short notice. It was a deal no fly fisherman could refuse. I rushed back to the hotel for our luggage (and my pack rod) while Phillipe arranged for the charter.

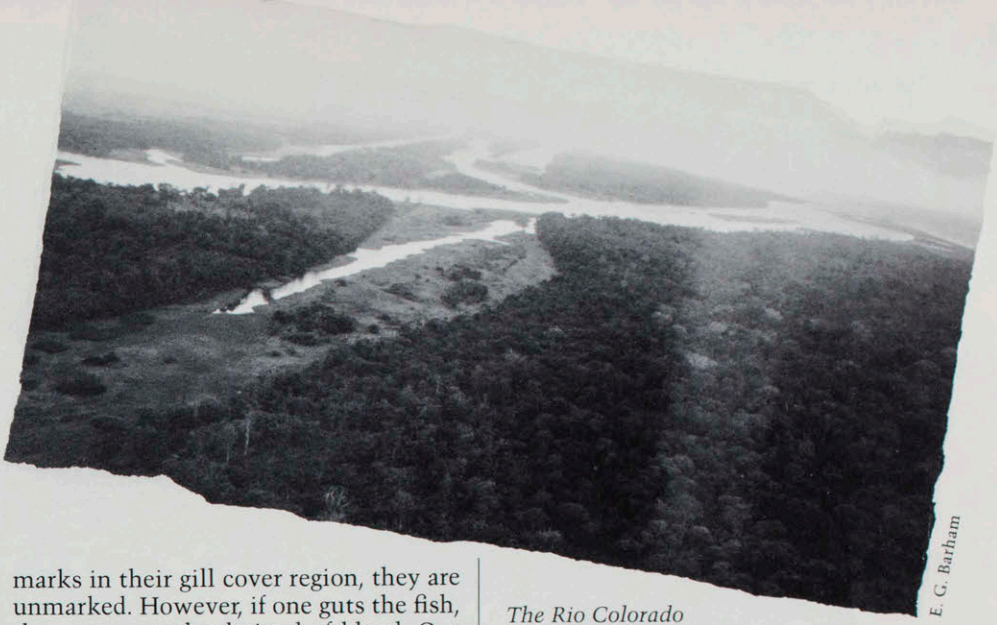
Even though it was hardly the wraparound view one gets from the waist bubble of a PBY, I had a good look at the countryside on the flight over. The coffee plantations on the San Jose plateau, shaded with purple jacaranda and crimson royal poinciana trees just blossoming into their early May glory, gave way to verdant mountains as we climbed and skirted around the infamous Irazu Volcano. We then dropped down over a broad, rain-forrested plain sloping gently to the sea. Just as we approached the coastline, the chocolate-colored waters of the Rio Colorado came into sight. The river is a major branch of the mighty Rio San Juan, which drains Lake Nicaragua

and creates a natural border between the two countries. As the Rio Colorado nears the coastal delta it flows into an inland waterway with numerous twisting channels, bayous, and lagoons separated from the sea by barrier islands. Ocean water intrudes through inlets and creates a two-layered system, with warm, turbid, river water overlying cooler, relatively clear, saline water. The system is the major migratory path for the movement of large numbers of tarpon and snook between the ocean and Lake Nicaragua.

We landed near the main village of Barra del Colorado, and a waiting boatman took us up river and into a long bayou to the Casa Mar. It was almost evening when we arrived. After stowing our gear, Phillipe and I sat with our host and several guests, members of a New York City fly fishing club, under a palm-frond thatched jalapa, listening to the sounds of the surrounding jungle, watching reflections of a dying sunset in the waters of the Laguna Agua Dulce, and talking over predinner drinks. It felt good to relax after the stresses of the past few months, and I was taking a deep seat and a faraway look, toying with my second gin and tonic, and not paying much attention to the conversation. Then one of the guests, a sports fishing writer named James Bashline, learning of our interest in cetaceans, began to tell the story of the vampire dolphins. (Following local usage, Bashline called them "porpoise," but because of the species involved, "dolphin" is more appropriate here. Regardless, the distinction between the two terms is tenuous at best.)

I cannot recall his exact words, but the gist of it had to do with certain dolphins that enter the inland waterway and are occasionally observed surfacing with large fish in their mouths. The cetaceans kill but do not eat the fish. Instead, after carrying them about in their mouths for a considerable time, the dolphins discard them. If the dead fish are recovered and examined, with the exception of teeth marks in their gill cover region, they are unmarked. However, if one guts the fish, they appear to be drained of blood. Our host, Bill Barnes, confirmed this story and added that his guides and the native fishermen are convinced that the dolphins suck the blood from the fish. They wanted to know if I'd ever heard of such a thing.

If their story was true, it was shocking information. Because of the riverine environment and geographical location, undoubtedly the species involved was the Atlantic bottlenose dolphin, *Tursiops truncatus. Tursiops:* the symbol of aphrodite; the playmate of the mythical nymph, Calypso; the sea hero befriender of man and child; the frolicking star of marine circus shows; the chatterbox "Flipper" of TV fame with the built-in smile; the cetacean most easily maintained and trained in captivity; the marine mammal most amenable to man's military applications; the subject of more experimental, physiological, and behavioral studies than any other cetacean; the species with whom Dr. Lilly attempts to converse. In brief, one of the most beloved and well-known wild animals in the world—if this story was true, then at least some Flippers were blood-sucking draculas, employing a form of predation that is abhored by most people.



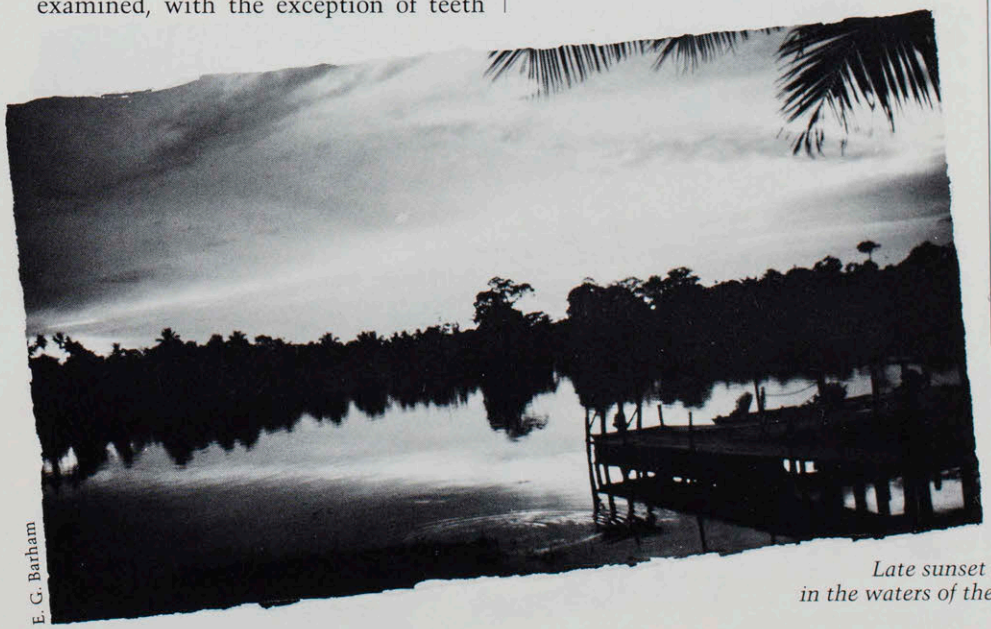
E. G. Barham

The Rio Colorado inland waterway as seen from the air on a rainy afternoon.

In the field of science, one had better be a skeptic. But I've also learned that those who make their living by fishing are excellent observers, although they may on occasion misinterpret what they see. I was not about to call the story a humbug. I mumbled something about hardly being an authority on cetacean behavior, and fortunately, before further cross-examination was possible, Mrs. Barnes called us to watch the feeding of her "pet" crocodile, which unfailingly showed up near the boat dock for handouts each evening at the sound of the dinner bell.

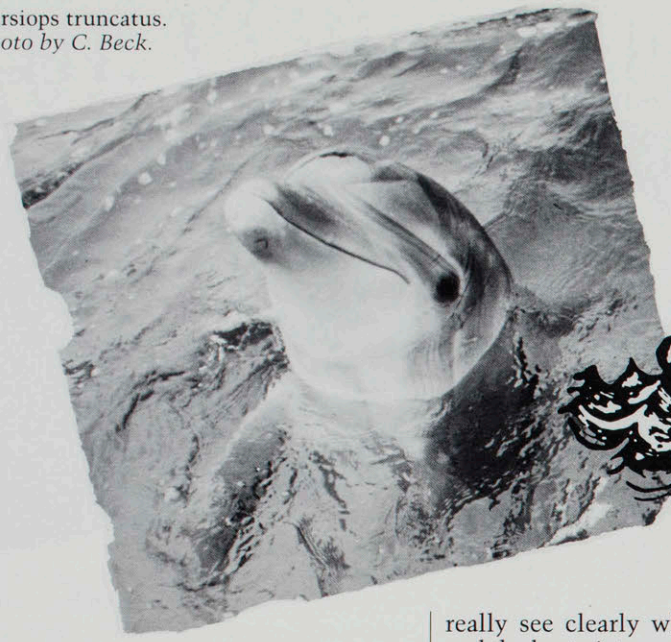
Bright the next morning, the guests, laden with fishing tackle and liquid refreshment, took to the river two by two in outboard driven skiffs manned by native guides. Mr. Cousteau preferred a book under the shade of the jalapa to a chance of proving his superiority over finny adversaries, so, with borrowed gear more suitable for fighting the mighty tarpon than my flimsy trout rod, I had a boat to myself. (As it turned out, Phillipe had little time for reading as every lady on the barra thought it a good time to visit Mrs. Barnes and incidentally chat with her handsome and famous guest.)

Harold, my Indian guide boat operator, and I shoved off last and followed the wake of the small armada downstream to an ocean inlet. By the time we arrived, the boats were scattered along the entrance channel, and the fishermen were casting and drifting their colorful flies in the outflowing current. Harold explained that from January to April the



E. G. Barham

Late sunset reflections in the waters of the Laguna Agua Dulce.



Tursiops truncatus.
Photo by C. Beck.

A seventeenth-century imprint of Arion playing his harp while riding on a dolphin's back.

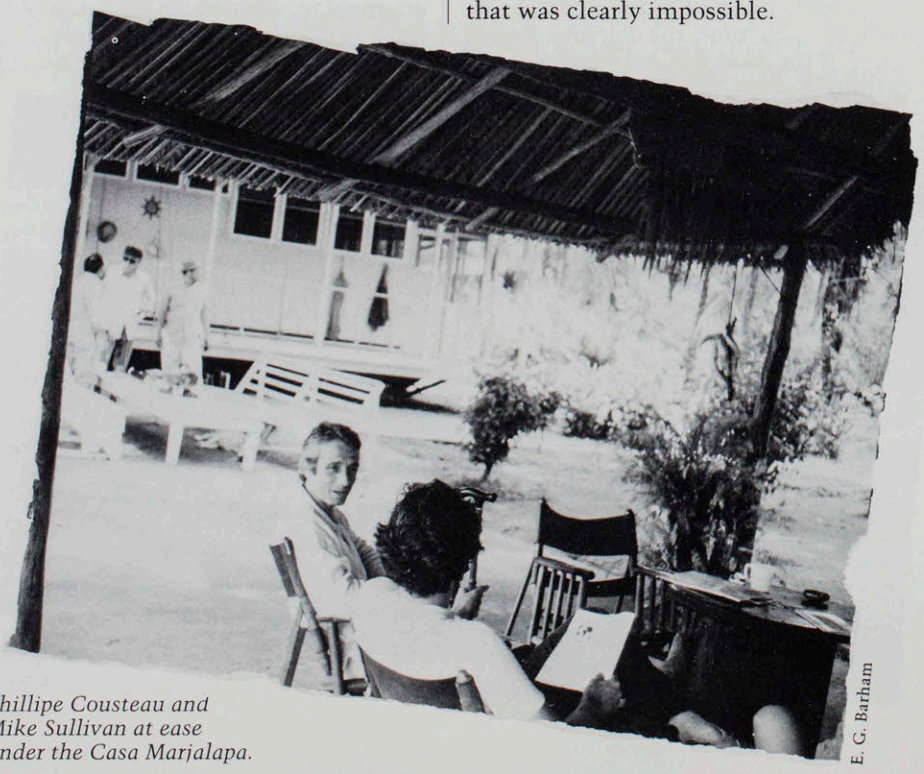
tarpon fishing is hot and heavy, but May is the tag end of the season, and for the past week, fishing for that species had been unusually slow. Each morning they had been probing the main channel leading to the sea to discover if one last pulse of ocean-fresh tarpon had entered the system. If no fish were jumped the little fleet would soon scatter with each guide attempting to beat others to the best tarpon holes where the silvery monsters rested in the deep, saline layer, occasionally surfacing to noisily gulp air and elevate the pulse rate of fishermen. As Harold had predicted, in a matter of moments, outboards were cranked up and skiffs went roaring off to all points of the compass.

We moved out, keeping company with Mike and Guy's boat, traveling slowly through a large bay. Suddenly Mike yelled that a huge tarpon had surfaced and pointed towards the northeast shoreline, a distance of about 700 feet. I looked in that direction just as the characteristic dorsal fin of a large *Tursiops truncatus* rolled into view. "It's a dolphin," I shouted. By this time Mike had his binoculars out and was searching the area. "There's something in its mouth," Mike yelled. "It looks like a fish." At my urging, Harold drove us alongside their skiff, and I excitedly gave them a short version of the vampire dolphin story. We decided to postpone the fishing.

For the next half hour we followed that dolphin around the bay, attempting to get as close as possible. It was not easy. The beast would never let us close in. One moment the dolphin would surface shaking the fish and making a bit of a splash, and then as we moved towards it, approaching perhaps within 300 feet, the creature would sound only to reappear a few minutes later at a greater distance for a repeat performance. We could never really see clearly what was happening, and the best pictures I got with a 135-mm lens only show the suggestions of a dark dolphin body and a dorsal fin. (Guy took some movie footage, but I've never had the opportunity to view the film.) Finally, the dolphin seemed to tire of the game — it discarded the fish and disappeared. The guide in the other skiff located the fish, gaffed it, and took it aboard.

Local protocol demanded that the fish, a large snook of about 12 to 15 pounds, be contributed to the larder of a nearby village. I got a chance to photograph and examine the specimen at the village boat landing. Teeth marks were obvious in the ventral opercular region just anterior to the gill slits. The gill covers were also torn and sliced in several places, but I was not sure if some of these wounds had not resulted from the gaffing. The gill filaments seemed abnormally bloated and gorged with dark red blood. I managed to snap a few pictures before the village headman came with a boning knife to claim his fish. Just then the cry of "fish on" echoed across the bay, and we were off to witness the fight of the only tarpon landed that day.

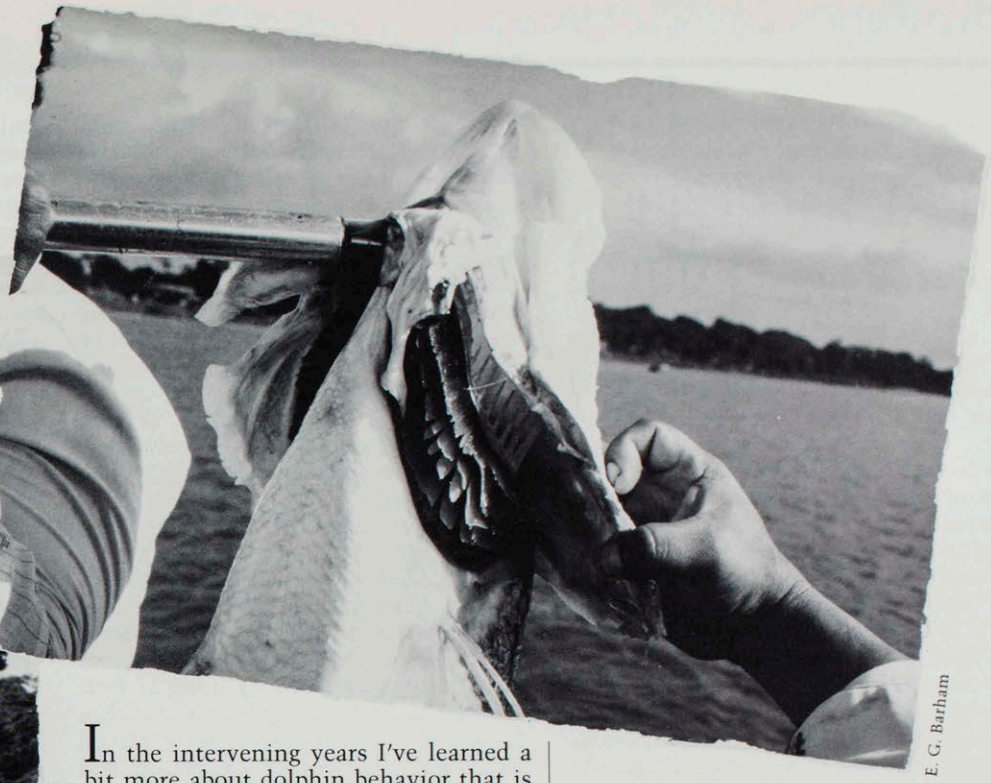
Many times since, I've wakened in the night and kicked myself for not staying at the village landing long enough to observe the cleaning of that snook. But I've rolled over and gone back to sleep with the rationalizing thought that fish do not have a large volume of blood, and because I have had no experience with snook innards, it would have been a guessing game. Further, strict proof that the dolphin had in fact sucked and ingested the snook's blood would have involved capturing (or killing) the dolphin as soon as possible after it had released the snook and then using a stomach pump (or dissection) to recover an identifiable sample. Under the circumstances, that was clearly impossible.



Phillipe Cousteau and Mike Sullivan at ease under the Casa Marjalapa.

E. G. Barham

The vampire dolphin's prey hanging on the gaff. The snook's blood-gorged gill filaments and torn gill covers are obvious.



E. G. Barham

The vampire dolphin rolls at the surface and shows its characteristic dorsal fin.

E. G. Barham

In the intervening years I've learned a bit more about dolphin behavior that is applicable to the question. Observations during aerial surveys of *Tursiops truncatus* populations of the inland waterways off Texas and the east coast of Florida (environments not unlike the Rio Colorado) indicate that riverine dolphins are highly territorial. While most of the animals are seen in small herds, lone individuals are not uncommon. Presumably, these are old "rogue" males who seem to be especially skillful at capturing large, elusive prey. In Matagorda Bay on the Texas coast, I observed such dolphins making their echo-location runs on large fish. As described in 1975 by Steve Leatherwood in his paper on feeding behavior of bottlenose dolphins, the cetaceans swim at high speed, either upside down or on their side, while making their final charge.

I've perused the literature and find nothing on a blood-sucking feeding mode in marine mammals, although members of the Trichomycteridae, a family of South American catfishes, are known to feed in this manner. C. H. Townsend's 1914 paper on the behavior of captive dolphins, probably the earliest publication on the subject, contains an interesting note. "Frequently a porpoise will play with a dead fish, thrusting its head clear of the water and throwing the fish five to ten feet away, when it is recovered and thrown again." Townsend goes on to say that eventually the fish is reduced to scraps, and adds that two or three porpoises may join in to demolish the fish.

Discussions with colleagues have also been informative. William Walker, who unfortunately was in Acapulco rather than with us that day on the Rio Colorado, was at one time curator of marine mammals at Marineland on Palos Verdes Peninsula. Bill tells me that occasionally captive porpoise have been observed carrying large fish around, in one case a yellowtail. The cetaceans bend them against the bottom of the tank, mangle them, and then discard them uneaten. Even with allowance for the fact that the behavior of confined creatures, particularly those high on the scale of animal intelligence is often aberrant, these accounts are strikingly similar to what we witnessed in Costa Rica. More illuminating to the vampire dolphin question, Dr. William Evans, Director of Hubbs Sea World Institute in San Diego, informs me he has heard that in Belize, British Honduras, about 300 miles north of the Rio Colorado, bottlenose dolphins capture bonefish, carry them around, and then discard them. No meat is eaten; tooth puncture marks are the only wounds; the fish are said to be bloodless.

Are vampire dolphins more than a local legend? Based on the limited observations and hearsay evidence that is presented here, it is impossible to reach a definite conclusion. However, blood sucking predation is widespread in the Animal Kingdom, and certainly *Tursiops truncatus*, as do all mammals, has the oral apparatus to practice this form of feeding. I would not be surprised if they do. Despite their romanticized image, they are, after all, wild animals.

Formerly a biological oceanographer best known for his deep submersible studies, Dr. Eric Barham is now retired and lives in Los Osos, California. His story on the vampire dolphins dates back to his association with the National Marine Service's Southwest Fisheries Center.

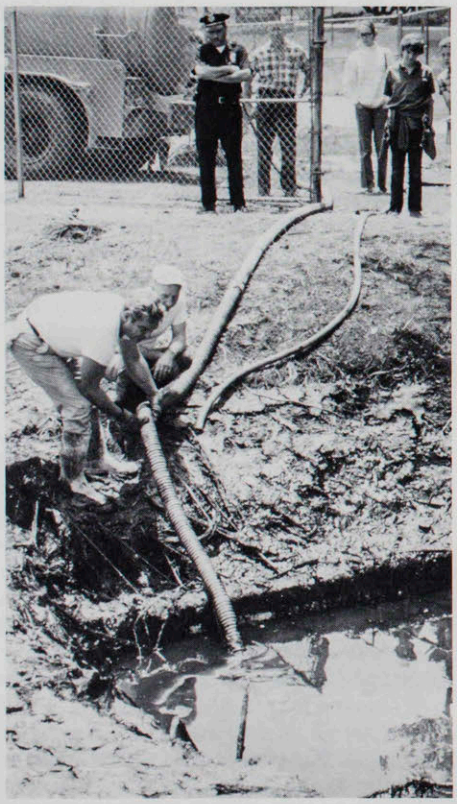
The Resurrection of Pit 91

by MARY LORRAINE ROMIG

After being closed for 54 years, Pit 91 was officially re-opened on June 13, 1969, and the Rancho La Brea Project was initiated. The decision to renew the excavation was based on the premise that, using modern techniques and studying all of the fossils, a more complete understanding of the paleoecology of Rancho La Brea would be possible. This was a major undertaking at first since it necessitated pumping out hundreds of gallons of asphalt, digging test trenches, and installing secure shoring before any serious excavation for fossils could begin.

Once test-trenching established the perimeters of the Pit, permanent shoring was installed with maximum safety in mind. Unlike the make-shift shoring of the 1913–1915 excavations, 60-foot steel I-beams were sunk around the sides of the Pit area, each side measuring 27 feet. Creosote-soaked shoring boards, 3 inches thick and 12 inches wide, were placed horizontally between each I-beam and bolted. To keep up with the constant water seepage, a sump was dug by hand on the east side of the Pit and a pump anchored above it. Picks and shovels were used during the first stages of the excavation to remove the back-fill, while dental picks, trowels, and chisels were employed later to carefully excavate the fossils. Orientation of bones larger than 1 inch was measured relative to an established datum (that is, a point of known elevation and horizontal position). Horizontal grids 3 feet by 3 feet were marked on the Pit floor with string, while the depth measurements were taken from the datum. The fossil deposit was excavated in 6-inch levels.

Initially, matrix (fossil-rich asphaltic sand) from each grid went into plastic-lined wooden boxes, but later, 5-gallon buckets that stacked easily and prevented matrix spillage were used. Asphalt was removed from the bulk matrix by immersion in a vapor degreaser containing boiling 1,1,1-trichloroethane (chlorethane), and the cleaned, dried matrix was then examined under a magnifying glass for small bones, teeth, insects, shells, seeds, and other micro fossils. Larger fossils were cleaned by hand outside using dental picks, small brushes, and solvents, while the smaller fossils were cleaned ultrasonically in the laboratory. (This cleaning process was considerably different and safer than that used in the earlier 1913–1915 excavation, where the fossils were cleaned in boiling kerosene.) Repair of specimens, identification, and cataloging were also conducted in the laboratory, which was housed in a small trailer located on the west side of the Pit compound. Although much Pit 91 material remains to be processed, thousands of specimens have already been cataloged, including many microfossils, providing data for a more thorough reconstruction of the paleoenvironment. Unfortunately, during the first excavation of Pit 91, very little emphasis was placed on the recovery of microfossils because of the 2-year time limit imposed upon the project, and consequently the fossil-rich matrix was discarded.



June 13, 1969. Pumping asphalt out of Pit 91.

1969. Mucking out Pit 91 prior to setting up grid system.

1969. Grid strings in place over Pit 91.

In November of 1970, an A-frame building was loaned to the Rancho La Brea Project for use as a laboratory, and a larger trailer replaced the original. During the ensuing years the Pit deepened inch by inch, shoring boards were installed as needed, and laboratory work progressed at an encouraging rate, all with the help of hundreds of volunteers. When the George C. Page Museum was completed in early 1977, the laboratory moved to its present location and the A-frame was dismantled. Excavation and degreasing were continued at the Pit until January 4, 1981, when funding for the Rancho La Brea Project was discontinued. The laboratory was shut down for 6 months while Pit 91 remained idle for 13 months.

A former staff member was rehired as Pit Maintenance Supervisor in February 1982, on a part-time basis, in order to maintain the Pit pending future excavation. During the next 5 months, with the aid of a few dedicated volunteers, 840 gallons of asphalt, which had accumulated during the previous year of inactivity, were hauled out of the Pit in 5-gallon buckets, and emptied into Pit 9. In addition, two hundred forty-nine 5-gallon buckets of asphalt that had been stacked in the compound for several years were emptied into Pit 9, and, along with thirty-one empty 55-gallon drums, were disposed of elsewhere. Additional shoring boards were installed along the bottom of the Pit walls and exposed bones were measured and removed in order to shore the open grid walls. The last exposed bones were removed in March 1984, and the entire central deposit of fossil bones is now neatly delineated by shoring boards. This deposit is roughly 6 by 15 feet and may extend downward 4 or more feet to a depth of about 17 feet. With a full crew of staff and volunteers, the remaining bones could be excavated in approximately 2½ years.

October 9, 1969. Lowering one of the 60-foot I-beams in place in Pit 91.

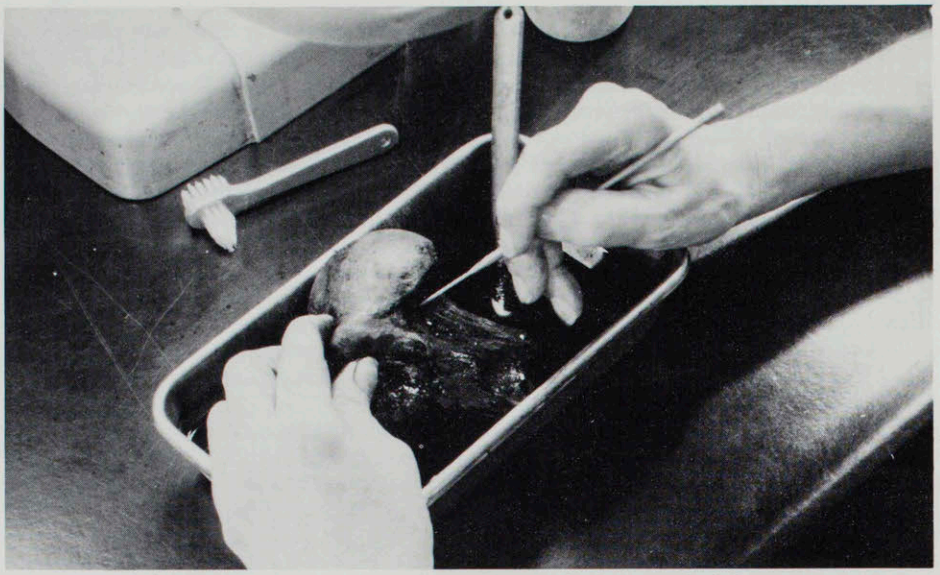
May 1980. Volunteer microsorting in laboratory of the George C. Page Museum.

Early in 1984, "Beautification of the Pits" was the operative phrase. Eight of the 60-foot I-beams that were stacked on the north side of the Pit compound were used for horizontal bracing in the Pit; the rest of the beams were removed. A volunteer crew with semi-heavy equipment donated their time one Saturday to level the compound area and dig water drainage channels. All of the sheds, Pit railings, and some of the I-beams received a fresh coat of paint, and new signs were made to hang on the compound fence.

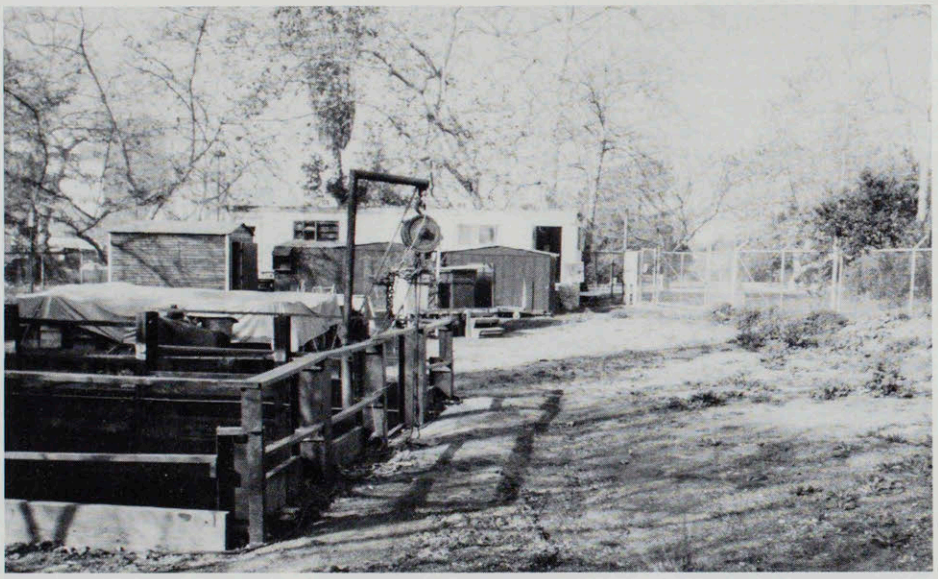
For 2 months during the summer Olympics, Pit 91 was open 6 days a week for visitors to watch paleontologists unearth the fossil bones of extinct animals. This was a unique opportunity for everyone, since further excavation may not take place in the near future. In the meantime, clean-up and maintenance continues on a 1-day-per-week basis but, to quote an old cliché, "We're all dressed up with no place to go."

Although Mrs. Romig has a degree in microbiology, she has always had a great interest in paleontology, and when the opportunity arose, she joined the Rancho La Brea Project as a volunteer in February 1970, working as a digger in Pit 91 until the Project hired her to manage the degreasing operation from 1977 to 1981. In addition to being Pit Maintenance Supervisor 1 day per week, she also volunteers as Research Librarian for the Chester Stock Memorial Library and as Archivist at the George C. Page Museum; she is presently very much involved with the preparation and curation of the Hancock Collection, which contains the fossils removed during the 1913 to 1915 excavations.

Photographs for this article are courtesy of the Rancho La Brea Archives, George C. Page Museum of La Brea Discoveries.

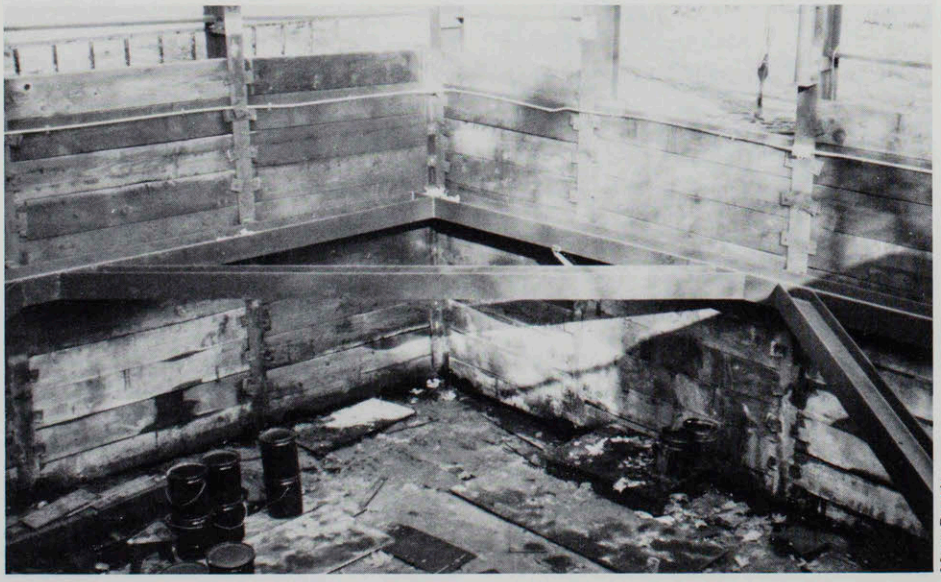


May 1980. Cleaning the broken humerus of a Saber-toothed Cat in the laboratory.



Mary Romig

1984. Pit 91 compound after refurbishing. Railing surrounding the Pit is to the left.



Mary Romig

Wall shoring and recent horizontal bracing in Pit 91.

TWO MONTHS AT TWO GREAT MUSEUMS

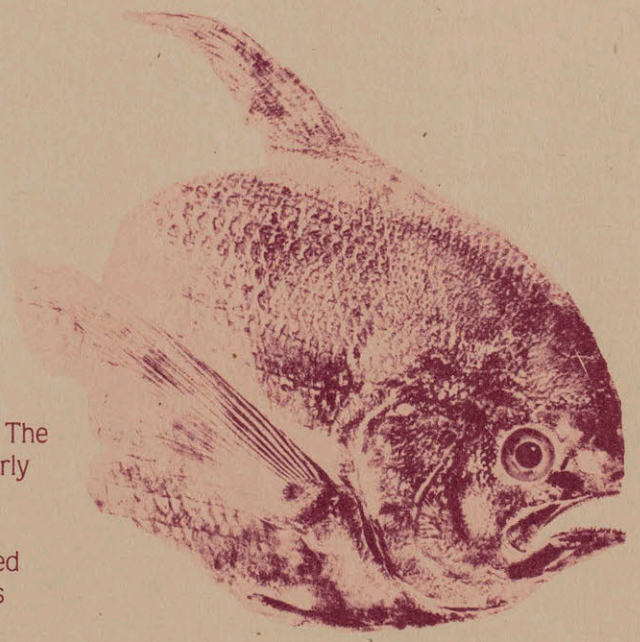
NATURAL HISTORY MUSEUM OF LOS ANGELES COUNTY, EXPOSITION PARK
PAGE MUSEUM OF LA BREA DISCOVERIES, HANCOCK PARK

SEPTEMBER/ OCTOBER 1984

CALENDAR OF EVENTS

Fall Craft Classes for Adults

During the fall months, the Education Division will be offering a selection of craft workshops for people 16 years of age and older. The classes for September and October are as follows.



Gyotaku (fish printing)

Dr. F. G. Hochberg, Instructor
Saturday, October 6, 9 a.m. to 4 p.m.
$25 members, $30 nonmembers

This class in the art of *gyotaku* or fish printing is being offered in conjunction with the exhibit, Pressed on Paper, on display in the Director's Gallery from September 18 through October 24, 1984. The techniques of *gyotaku* were first developed in the Orient in the early 1800s as a method of recording a fisherman's catch. Recently the traditional techniques have been refined into a sophisticated and unique art form. Dr. Hochberg, one of America's most accomplished nature printers, will conduct this interesting workshop. Basic tools and materials will be provided. Limit, 20 people.

Pine Needle Basketry— Beginners

Judy Mulford, Instructor
Saturday, October 13, 9 a.m. to 4 p.m.
$20 members, $25 nonmembers

Learn basic coiled basketry techniques in this one-day workshop for beginning basketmakers. Utilizing pine needles as a foundation and pattern material, you will create a decorative and functional basket. All materials provided. Limit, 10 people.

Wild Bird Carving

Robert Young, Instructor
Three Saturdays, September 15, 22, and 29,
9 a.m. to 1 p.m.
$35 members, $40 nonmembers

In this class you will learn basic woodworking techniques while carving, detailing, and painting stick decoys of local shore birds such as sandpipers, plovers, and avocets. The fascinating history of birdcarving will also be explored. These sessions will interest bird lovers as well as admirers of antique decoys. Limit, 14 people.

Please send the form below and your check or credit card information with a stamped, self-addressed envelope to Joan Grasty, Education Division, Natural History Museum, 900 Exposition Boulevard, Los Angeles, CA 90007.

For further information, please call the Education Division, 213/744-3341.

I would like to attend the museum's fall Craft Workshop.

Name _____

Address _____

City _____

State _____ Zip _____

Phone Number _____

Please check the workshops you wish to attend:

☐ **GYOTAKU (fish printing)**
Saturday, October 6, 9 a.m. to 4 p.m.
$25 members, $30 nonmembers

☐ **PINE NEEDLE BASKETRY**
Saturday, October 13, 9 a.m. to 4 p.m.
$20 members, $25 nonmembers

☐ **WILD BIRD CARVING**
3 Saturdays, September 15, 22, and 29
9 a.m. to 1 p.m.
$35 members, $40 nonmembers

☐ My check is enclosed (please make payable to "Natural History Museum Foundation")

☐ Charge to my VISA/MasterCard/American Express (please indicate which card)

Card Number _____ Expiration Date _____

Signature _____

Special Thanks for a successful "Celebrate America!"

Approximately 3,000 members and friends of the museum attended the gala opening on June 8, 1984, of the museum's three Olympic Arts Festival exhibitions and new American history hall. Museum Director Dr. Craig Black and Olympic Arts Festival Director Robert Fitzpatrick hosted a moving ceremony officially opening "The Games of the Xth Olympiad: Los Angeles 1932," "U.S.A.—1932," and "Automobiles of '32." Supervisor Kenneth Hahn and museum docent emeritus Clarita Neher, a 1924 and 1928 Olympian, introduced and honored our special guests—fifteen athletes from the Xth Olympiad. The 1932 Olympic exhibitions are part of the Olympic Arts Festival of the 1984 Olympic Games, sponsored by the Los Angeles Olympic Organizing Committee with the support of the Times Mirror Company.

Many organizations and individuals loaned objects from their collections and contributed support, time, and materials to the three exhibitions and history hall. The museum would like to give special thanks to those listed here.

The Games of the Xth Olympiad: Los Angeles 1932

First Interstate Bank Athletic Foundation
Security Pacific National Bank Photograph Collection—Los Angeles Public Library
Occidental College Library—Bill Henry Collection
Los Angeles Memorial Coliseum Commission
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Dr. E. Clarke Deacon
Frank W. Doherty
Carolyn B. Farnham
Richard Farmer
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The Bill Henry Family
International Olympic Committee Archives
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Frank Mannie, Herbert Hoover High School—Paul Diffley, Instructor
Mr. and Mrs. Wayne A. Miller
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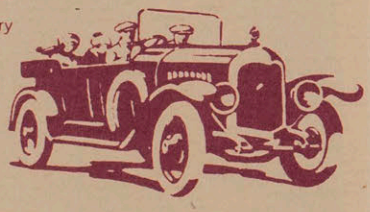
J. Richmond Nelson
Mr. and Mrs. Joseph Platte
Pauline K. Prezant
Charles E. Shelton
Mrs. Laverne Stevens
Inez Trussell

U.S.A.—1932

John Snyder, Times Mirror Company
Sol Pavlosky, The Society to Preserve and Encourage Radio Drama



The Automobiles of 1932

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Donald J. Glaub
Clifford Gooding
Ronald E. Griffin
Harrah's Automobile Collection, Reno, Nevada
Imperial Palace Automobile Collection, Las Vegas, Nevada
JTS Leasing Corporation, San Francisco, California
Harry Martinovich
Bob Mills Ford
Gary Stanley

Growth of the Nation

Mrs. Frank R. Seaver and The Seaver Institute

The Donation of the Civil War Collection

Security Pacific National Bank

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United States Marine Corps, Color Guard of Pasadena
The Docent Roundtable
Pennyroyal
The High Life Band
The Hyperion Outfall Serenaders

1932 Olympians

Evelyne Hall Adams
Herbert Barthels
Dallas Bixler
John Frick
Simone Schaller Kirin
William Kuhlemeier
C. H. McCallister
Alfred Maasik
Jane Fauntz Manske
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Albert Schwartz
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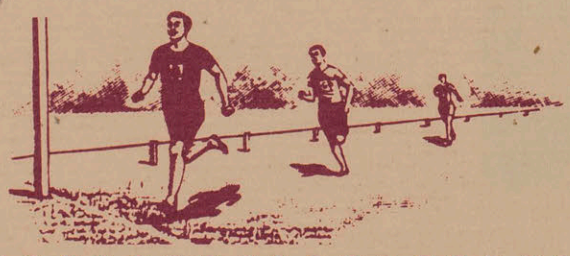
Robert Van Osdel

Special Exhibitions Hall Photographs

Coca-Cola Bottling Company of Los Angeles



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NATIONAL ENDOWMENT FOR THE HUMANITIES MATCHING GRANT

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Mrs. Suzanne A. Stone & Richard Stone
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This list was generated by computer and may contain errors. We welcome corrections. Illustration by Margaret A. Wilson. Courtesy of Giles W. Mead.

FREE FILM AT PAGE MUSEUM

"The Hot-Blooded Dinosaurs" will be featured at the Page Museum on Tuesday, September 11. The film will be screened in the museum's Education Classroom; the museum is open free of charge on the second Tuesday of each month, and free admission to the film is included.

The film program begins at 1:30 p.m. and lasts about an hour and fifteen minutes. For further information, call the Page Museum, 213/857-6306.

The Family Film Series at the Natural History Museum's Jean Delacour Auditorium will be reinstituted soon with an entirely new line-up of films on the natural sciences and history. Film programs and schedules will be announced in the future.

OPENING EXHIBITS

Pressed on Paper. September 18 through October 24, 1984.

The Center Space: Pueblo Indian Architecture. October 9 through January 13, 1984.

CONTINUING EXHIBITS

The Ancient Greek Games. Through September 16, 1984.

The Games of the Xth Olympiad. Through October 14, 1984.

The 1932 Automobile Salon. Through October 14, 1984.

U.S.A.—1932. Through October 14, 1984.

Mushrooms Up and Down Los Angeles. Through September 2, 1984.

The Gregorian Calendar. Through September 30, 1984.

California Condors. Through October 28, 1984.

The Natural History Museum, located at 900 Exposition Boulevard, Exposition Park, Los Angeles, California 90007, is open from 10 a.m. until 5 p.m., Tuesday through Sunday. The museum is closed Mondays, Thanksgiving, Christmas, and New Year's Day. Admission is $1.50 for adults and $.75 for students and senior citizens; children under 5 are admitted free. For further information on museum activities and future events, please call the Membership Office, 213/744-3426.

The Page Museum of La Brea Discoveries, located at 5801 Wilshire Boulevard, Hancock Park, Los Angeles, California 90036, is open from 10 a.m. until 5 p.m., Tuesday through Sunday. The museum is closed Mondays, Thanksgiving, Christmas, and New Year's Day. Admission is $1.50 for adults and $.75 for students and senior citizens; children under 5 are admitted free. For further information, please call 213/857-6311.

School Tour Service

October marks the beginning of the 1984-85 School Tour Season. It should be an exciting year as over eighty docents conduct almost 2,500 guided tours through the museum's varied halls. Two new tours will be offered this year. One will focus on *Growth of the Nation*, the new Seaver Hall of United States History; the other will introduce visitors to *The Center Space: Pueblo Indian Architecture*, a special traveling exhibit.

Tours for classes will be available Tuesday through Friday at 10, 11, or 12 o'clock. Reservations are necessary.

For more information call 213/744-3333 between 9 a.m. and 4 p.m.

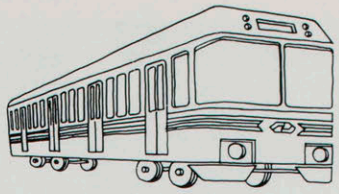
Lending Service Opening

On Tuesday September 11, the Natural History Museum Lending Service opens for another year of public borrowing. For an annual $5.00 membership card fee, an adult may borrow a variety of historical and scientific objects, pictures, and slides for a two-week loan period. These materials allow you to bring the museum into your home or classroom.

LENDING SERVICE HOURS
(beginning September 11)
Tuesday through Friday 2:00 p.m. to 5:00 p.m.
Saturday 10:00 a.m. to 3:00 p.m.

Parking is available in the "Staff Only" parking lot next to the Educational Services entrance.

For additional information call 213/744-3345.



METRO RAIL MEETS THE TAR PITS

by BILL AKERSTEN

Conjures up images of a low budget science-fiction thriller you might find on the tube during the wee hours of the morning, doesn't it? In a way it is similar, with two enormous protagonists seemingly headed for inevitable conflict. The one, a gleaming metallic monster of man's creation, capable of much good and much destruction and endowed with almost irresistible force. The other, a massive slumbering giant formed eons ago from black oozings of the earth's bowels, peaceful except when threatened by human activities.

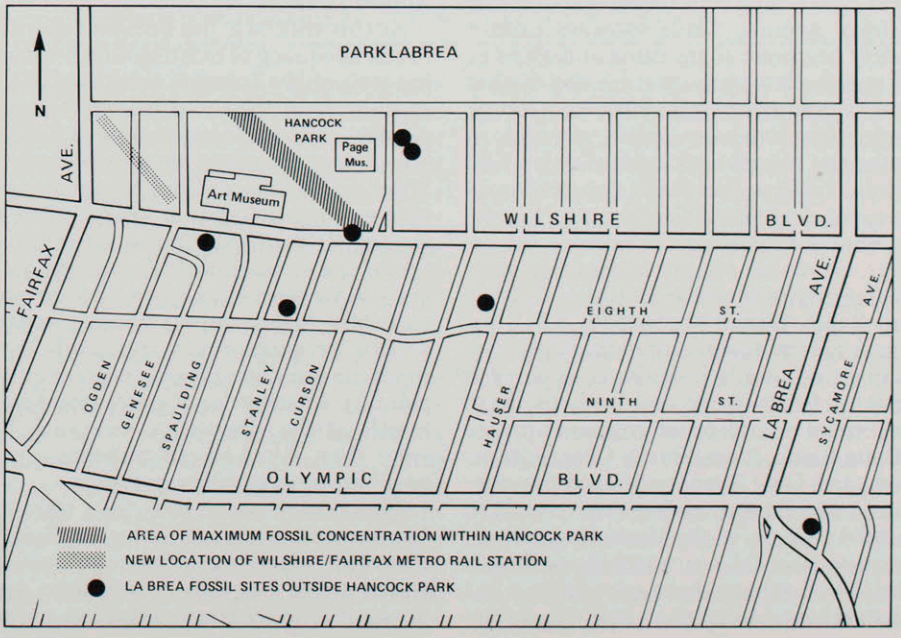
The element of science-fiction *is* present, science and fiction at times being so intertwined that they become difficult to separate. Part of the fiction concerns just how complete our knowledge is of Rancho La Brea and its Ice Age fossils. The "Tar Pits" have long been famed for their immense quantities of incredibly well-preserved fossils. More scientific and popular articles have been based on them than on fossils from any other site. Thus, many feel that there is little more to be learned from this magnificent storehouse of the past. Nothing could be farther from the truth! There is far more undiscovered knowledge about La Brea and its fossils than has been ferreted out to date.

Much of the original research on Rancho La Brea was conducted prior to 1935. Since that time, paleontology, like any vigorous and growing field of study, has constantly progressed into new and more sophisticated areas, many of which were conceived during just the past several decades. Also, research to answer one particular scientific question almost inevitably uncovers several new questions. In other words, the more you know about something, the more evident become the things you don't know. We now know enough about Rancho La Brea to understand that it is almost unique in its potential for providing new information relevant to many areas of scientific investigation.

Another bit of science-fiction concerns the extent of La Brea fossil deposits. Because Hancock Park was set aside specifically to protect and interpret the fossil resources of the tar pits and because most of the fossils have been collected within the boundaries of the Park, most people logically assume that La Brea fossils only occur inside the Park. As the map shows, a number of fossil deposits are known east and south of Hancock Park, one almost three-quarters of a mile to the southeast. There are other, unconfirmed, records suggesting that deposits may exist even farther away. In June 1973, a retired contractor, Mr. Chris Simovitch, visited the Rancho La Brea Project and told me that many years ago he had worked on a job where bones had been found in asphalt on Willoughby Avenue about two blocks east of Fairfax. This is about a mile and a half *north* of Hancock Park. La Brea-type fossil deposits could turn up almost anywhere in the area.

The scene is set and the metal monster feels the first stirrings of life as man seeks to enlist his aid for the good of Los Angeles. The slumbering fossil giant briefly rouses to a faintly perceived challenge, then returns to his lair. While rumors of a subway system for Los Angeles came and went from time to time, my first inkling that something might be solidly afoot came during the winter of 1977–1978. Ray Bernor, with whom I had collected fossils in Iran during 1975, came to me for information regarding the importance and distribution of Rancho La Brea fossil deposits. He needed the data for a draft preliminary EIR/EIS* report being prepared for a potential subway system through the area of the tar pits. The tentative plan included tunneling at depths of 60 to 120 feet below the surface with station construction at Wilshire/La Brea, Wilshire/Hauser, and Wilshire/Fairfax. In August

*The acronyms EIR and EIS refer to documents required by the State of California and the federal government, respectively, which address a wide variety of impacts any development project may have on people and the environment and the steps that should be taken to mitigate major impacts. A draft report is first prepared, then comments are invited and hearings may be held as to the adequacy of the draft. After all input is taken into consideration, a final report is produced.



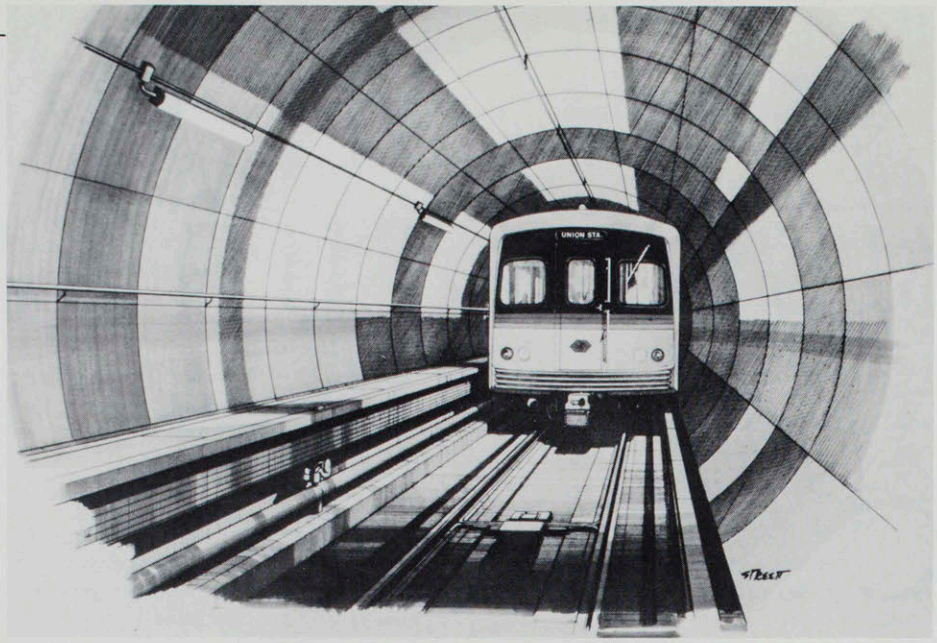
1979, I submitted a comment on the draft report stating that while the La Brea and Fairfax station construction had only a modest probability of encountering fossils, the station at Hauser had a very high probability of doing so. I also noted that underground tunneling at the depths described would have no impact upon the fossils since they are not known to occur deeper than 55 feet. The Hauser station was later dropped from consideration.

For a while, things remained fairly peaceful on the Metro Rail front as the creature gradually gathered strength. There were some additional hearings and public meetings—my wife went to several—but no change was indicated in the basic plans to tunnel at considerable depth and to have stations at the intersections of Wilshire/La Brea and Wilshire/Fairfax.

Suddenly, peace and tranquility vanished and the sleeping beast of the tar pits awoke into snarling watchfulness in the summer of 1982. An old friend, John Cooper of California State University, Fullerton, called to say that he was doing a more thorough study of potential impact on fossil deposits now that the route had been finalized. He asked if several recent changes, tunneling at depths as shallow as 30 feet and relocation of the so-called Wilshire/Fairfax station to under Wilshire Boulevard in front of the George C. Page Museum, were likely to change the potential for impact on Rancho La Brea fossils.

I told him that tunneling at this shallower depth would result in the destruction of fossil deposits and that I couldn't think of a station location more likely to impact major fossil deposits than the new one. It cut right through the area of maximum fossil concentration. As it turned out, the new location was chosen so that the subway tunnel could make a gentle sweeping turn to the North under Fairfax Avenue. Since subways cannot safely negotiate sharp turns at high rates of speed, placing the station any farther west would necessitate building a longer and more expensive series of turns to bring the tunnel back under Fairfax. Little did I realize that these changes would keep me busy for much of the next 2 years.

After John Cooper submitted his report, there was a flurry of meetings with representatives of the Southern California Rapid Transit District (SCRTD) because federal law required that potential impact on fossils must be considered if federal funds were involved. In these meetings, I and other museum people (Craig Black, John Harris, George Jefferson, and Greg Byrd) presented our concerns. We did not wish to stop or even to hinder progress of the Metro Rail system, but we also did not want to see fossils destroyed or have them salvaged in a less than acceptable manner. Individual reactions ranged from a flat "move the station elsewhere" to "this could be a tremendous opportunity to learn more about La Brea if done properly." I took the latter view but pointed out to the transit people that doing the job properly could be very expensive and time-consuming at this particular location. Selection of an alternative farther from the main concentration of fossil deposits might save a lot of time and expense while still yielding a bonus of scientific information.



Artist's rendering of proposed subway train traveling through tunnel. Courtesy of SCRTD.

The SCRTD requested that we put together a proposal for (1) evaluation, from existing data, of the extent of fossil deposits that might be present at the station location and (2) development of a master plan for salvage of fossils. Before the proposal could be finalized, however, there was another meeting that was attended by a representative of the Federal Urban Mass Transportation Administration.

At this meeting, the question arose as to the adequacy of existing data for making reasonably accurate estimates of the magnitude of the fossil resources at the primary station location and at several alternative locations to the west along Wilshire Boulevard. Could we guarantee that moving the station would result in finding fewer fossils? We answered that, while the probabilities of finding fossils at more western sites appeared to be considerably lower, only a comprehensive testing program could accurately estimate the number of fossils present at the primary location and guarantee fewer fossils at the alternative locations. We were then asked to put together a proposal for such a testing program.

This turned out to be quite a task. We knew that boring test holes to directly examine what lay below the surface would work and that it would be very expensive. So we tried to find less expensive surface methods that would reveal subsurface deposits. Most were not useful. The only remote sensing method that might help was a device that measured the electrical conductivity of materials under the ground. Most sediments conduct electricity quite well except when soaked with asphalt (a good insulating material). When tested, this terrain conductivity meter appeared to do a good job of finding asphalt. However, there is a lot of asphalt under the ground at La Brea that does not contain fossil deposits. Another method being developed by the Jet Propulsion Laboratory holds promise but has not yet been completely developed and tested.

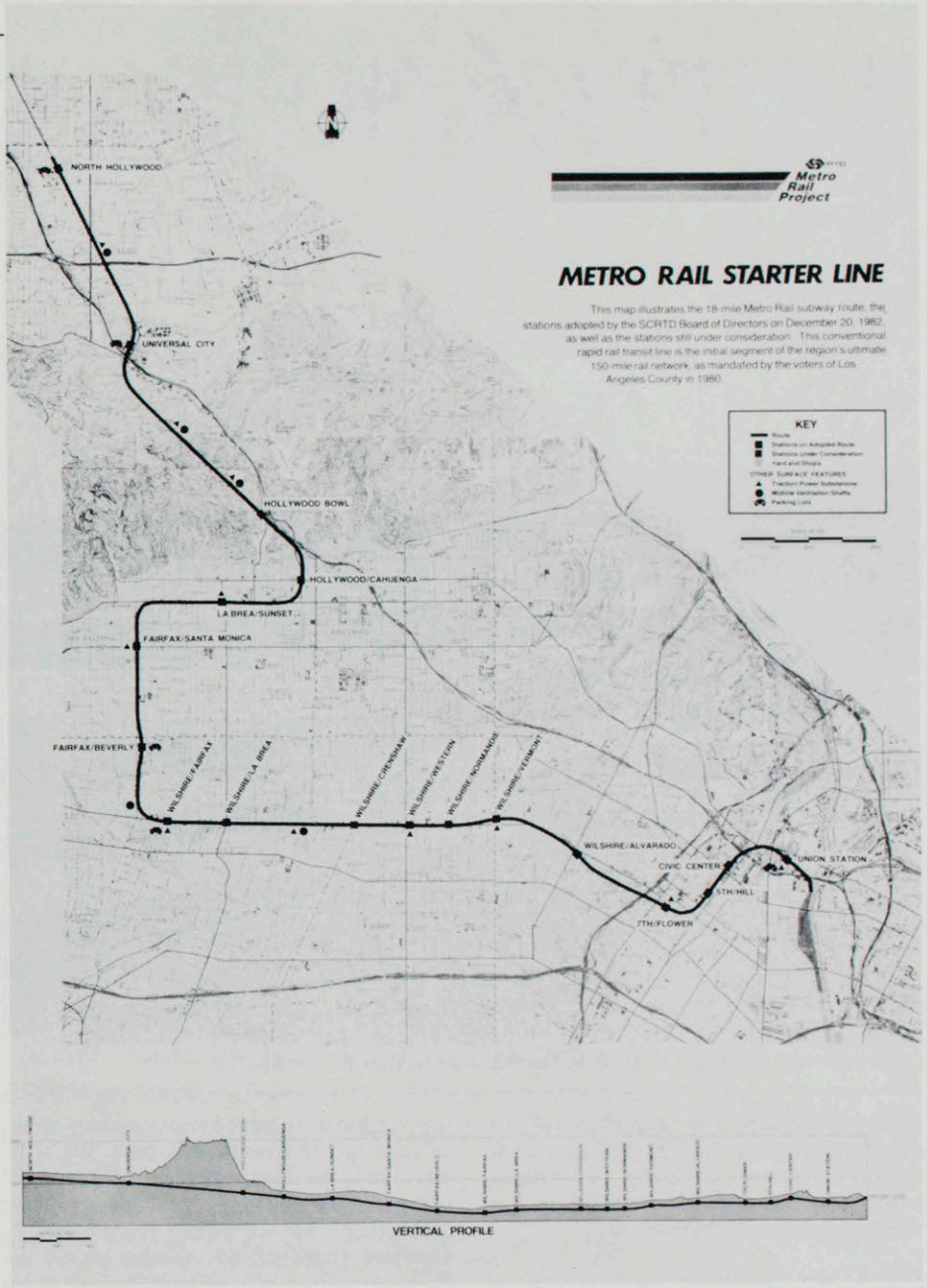
This not only left us with having to rely on bore holes but also led to another problem: most individual fossil deposits at Rancho La Brea are rather small in diameter, though they may extend to considerable depths. As many as 100,000 bones have been recovered from a deposit about 10 feet in diameter. To be sure of not missing major fossil deposits in a program of test borings, the holes would have to be very close together. Since the SCRTD wanted to test an area the width of Wilshire Boulevard from Hauser Boulevard to 600 feet west of Fairfax Avenue (an area 80 feet wide by 3,600 feet long), more than 1,300 bore holes 60 feet deep would be needed. Just the cost of plugging each bore hole according to code, then having it inspected by the city, was $300, or about $400,000 total. Additional costs would result from the short deadline imposed and the need for specially trained geologists on duty during each boring, traffic control while drilling in a busy street, disposal of waste material, and so on.

It took several months of work by me, John Harris, and several subcontractors

to finalize the testing plan. Even with substituting less expensive methods for some of the bore holes as well as cutting other corners, we could not guarantee a cost of less than $2 million. Because of this and other factors, the concept of such an extensive testing program had to be abandoned. Two months of work by a number of people down the drain! We then agreed to submit a proposal for development of a Master Plan for Mitigation which would include some site testing and a detailed plan with cost estimates for fossil salvage and preservation.

At about this time, reporters learned of the Metro Rail's potential for impact on La Brea fossils and started to contact us for more information. The next couple of weeks were a real circus, with the phone ringing constantly. I talked to representatives of all the local media, many national news reporters (including those of the *New York Times*, NBC Network news, and UPI), and even gave a live telephone interview to WBBM, Chicago. The *Los Angeles Times* requested an article for their Opinion section. It became very difficult to avoid being pulled into unnecessary controversy. To judge from clippings sent by friends, the story was featured in newspapers across the country. One packet of letters suggesting ways to avoid impacting the fossils came from an elementary class in Soldatna, Alaska. At the same time, the SCRTD was holding hearings on their draft EIS/EIR and many members of the public expressed concern for the fossils.

After the furor died down a bit, we signed an agreement with SCRTD and started work on the Master Plan. I hired Roy Salls, Toni Tejada-Flores, and Chris Shaw to help me with the task. Roy is a retired LAPD officer and long-term Page Museum volunteer tour guide and has a Master's degree in archaeology. Toni worked at the Rancho La Brea Project from 1970 until it ran out of funds in 1981, and she has been active in La Brea research since then. Chris has worked for the Page Museum since 1975. John Harris took care of administrative matters and oversaw our work.

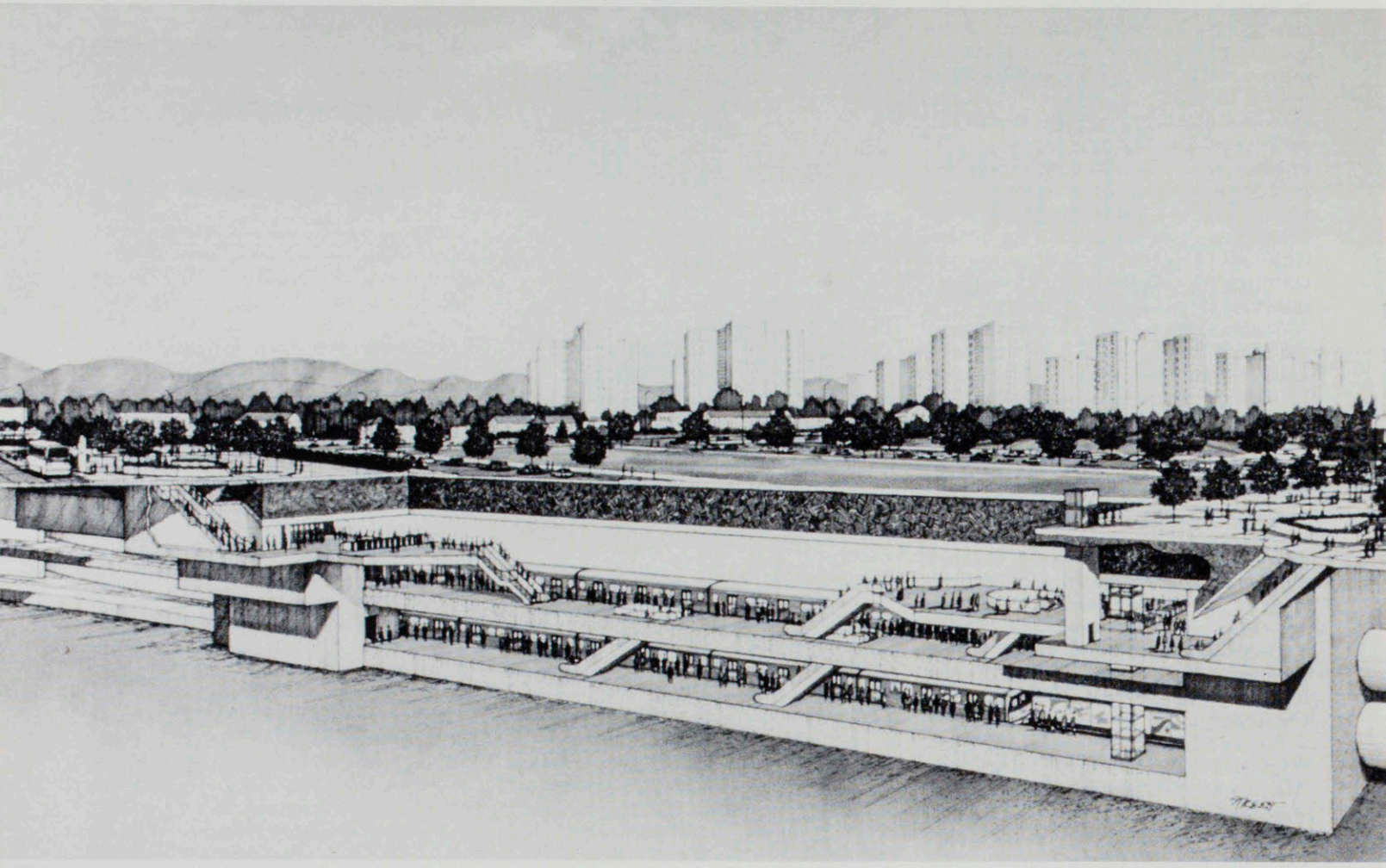

Metro Rail Project
METRO RAIL STARTER LINE
This map illustrates the 18-mile Metro Rail subway route, the stations adopted by the SCRTD Board of Directors on December 20, 1982, as well as the stations still under consideration. This conventional rapid rail transit line is the initial segment of the region's ultimate 150-mile rail network, as mandated by the voters of Los Angeles County in 1980.
KEY
NORTH HOLLYWOOD
UNIVERSAL CITY
HOLLYWOOD BOWL
HOLLYWOOD/CAHUENGA
LA BREA/SUNSET
FAIRFAX/SANTA MONICA
FAIRFAX/BEVERLY
WILSHIRE/FAIRFAX
WILSHIRE/LA BREA
WILSHIRE/CRENSHAW
WILSHIRE/WESTERN
WILSHIRE/NORMANDIE
WILSHIRE/VERMONT
WILSHIRE/ALVARADO
CIVIC CENTER
UNION STATION
5TH/HILL
7TH/FLOWER
VERTICAL PROFILE

Map of alignment of proposed metro-rail project. Courtesy of SCRTD.

The primary goal of the Master Plan is two-pronged: to assure proper protection, salvage, and documentation of La Brea fossils impacted by Metro Rail construction, and to work out new techniques to do this as rapidly and efficiently as possible so that construction will not be delayed. While much of the work was sheer drudgery, some recent technological developments we uncovered offer exciting promise in the area of collecting large amounts of data very rapidly.

One of the major reasons that the excavation of Pit 91 by the Rancho La Brea Project went so slowly, and is still not complete, is the huge amount of time needed to carefully measure and record the position of each bone before removing it. However, even after the time taken to gather this data, we still can't work with it until it is entered into a computer. We found a new device, called a Sonic Digitizer, which quickly and accurately locates a point in three dimensional space. All you have to do is touch the point with a stylus and press a button, the device will automatically calculate the position of the point *and* record it on a computer disc at the rate of up to 30 points per second. While it has never been used in a dig, it seems perfect for the purpose. Sonic Digitizers aren't cheap (they cost about $20,000 to $30,000), but would quickly pay for themselves in time saved. If one could have been used on the Pit 91 excavation, that dig would have been completed long ago. A similar, but less expensive, system is being developed by the Canadian Heritage Information Network (CHIN) for use in archaeologic excavations. CHIN hopes to be able to test a prototype this summer. If nothing else, we are participating in the beginnings of a new technological era for paleontologic and archaeologic data gathering.

The search for a method to safely remove large blocks of fossiliferous material very rapidly has been less successful. This may become necessary if time does not permit even the speeded up techniques we have worked out for *in situ* collection of the fossils. One major problem is that the fossils are so tightly packed that cutting a deposit into blocks will damage or destroy many of them. Another problem is that the mixture of asphalt and sand surrounding the fossils is so soft that the blocks would become



Cut-away view of proposed Wilshire/Fairfax station. Courtesy of SCRTD.

distorted between the time they are cut and the time they can be stabilized with a rigid covering. Chilling the blocks might help them hold their shape but presents engineering problems.

Just as we completed the first draft of the plan, the SCRTD worked out an agreement to move the station location to the present May Company parking lot, just west of Hancock Park. This new location is to one side of the main concentration of fossil deposits and should contain far fewer fossils than the previous location in front of the Page Museum. By placing the station on a northwest-southeast diagonal, the more economical gentle curve from Wilshire to Fairfax can still be used. Terms of the agreement will cut station construction costs by some $30 million and provide up to 15 years of storage for salvaged fossils. A few problem areas remain, but it now looks as though the major ones are solved. Most of the fossils will remain undisturbed, but any that may be found will be properly salvaged and preserved. Meanwhile, the fossils won't stand in the way of Metro Rail development, and changing the location saved more money than salvage of the fossils will cost. We still stand to learn a lot about our tar pits, and we have already learned about new collecting and surveying technologies. Our two potential adversaries appear to have come to a lasting truce rather than battling to the destruction of one or both.

A draft of the Master Plan was submitted to the SCRTD in early December 1983. They reviewed it and returned it with their comments and suggestions in March. At the time of this writing, we have just submitted the revised 230-page plan. Meanwhile, other things have been happening. A peer review board is being formed by SCRTD to review the Master Plan. It will include two paleontologists, one archaeologist, one civil engineer, and one geotechnical engineer. At least one test excavation is under consideration to test engineering and scientific aspects of digging at the May Company site. Studies are being conducted to more accurately determine the minimum depth at which tunneling can be conducted without running into La Brea fossils. By the time you read this, we should be much farther along. Depending on obstacles yet to be overcome by Metro Rail, there may be additional chapters to this saga of the past and the future.

Even if Metro Rail should not become a reality, other developments planned for this area will undoubtedly encounter large numbers of La Brea fossils. Since federal funds will not be involved in these, the more stringent federal laws for protection of paleontologic resources will not apply. We will continue to work for protection of these irreplaceable sources of knowledge. May the slumbering giant continue to rest peacefully under the Miracle Mile.

Dr. William A. Akersten, Curator of Vertebrate Paleontology, is in charge of the museum's collections of Pleistocene nonmarine vertebrates. He first came to the museum in 1972 as Coordinator of the Rancho La Brea Project (see "The Resurrection of Pit 91," by Mary Romig in this issue) and was Curator of Rancho La Brea from 1975 to 1982. His current research on Rancho La Brea includes a discovery that the Saber-toothed Cat, Smilodon, *probably used its huge canine teeth to bite, rather than stab.*

IMPRESSIONS OF NATURE

by F. G. HOCHBERG

During the past ten years there has been a tremendous proliferation of workshops, exhibits, and articles on nature printing. The first exhibit of nature prints by American artists was assembled at the Santa Barbara Museum of Natural History in 1975. From these tentative beginnings the Nature Printing Society was formed in 1976 to provide a base for exchange of information and ideas on nature printing. The Society currently lists over 100 members. In 1980 the Smithsonian Institution invited the Society to assemble a major exhibit of nature prints. Organized by the Santa Barbara Museum of Natural History and the Nature Printing Society, the exhibit Pressed on Paper opened at the National Museum of Natural History in April 1981 and has been on tour ever since. The exhibit brings together for the first time the best contemporary printmakers from the United States, Canada, and Japan. Prints by thirty-three artists were selected to present a comprehensive view of the diversity of styles, techniques, and subjects that can be employed in this unique art form.

Pressed on Paper will be on display in the Director's Gallery at the Natural History Museum from September 18 through October 24, 1984. As you view the images on these pages and in the exhibit, stop for a moment and reflect on these impressions of nature. As we rush headlong into an era of ever increasing speed and complexity, the artists have reached back in time to revive centuries old techniques. In the process, they have captured the essence of nature, which on all sides surrounds our lives but from which we are becoming increasingly isolated.

Impressions of nature have been created for centuries in all parts of the world. Nature prints date from the dawn of man's attempts to capture images of the world around him. The first prints were direct extensions of early man. Prints and silhouettes of hands are found associated with primitive cave paintings around the world. These signature prints constitute a permanent visual record of the artist's existence. Even today such prints are among the strongest statements of an individual's identity. Police maintain extensive files of finger prints, birth certificates often record a baby's foot prints, palmists print and study the hands of man. All are expressions of man's desire to record his

existence and his individuality.

Nature printing is defined as a means of using pigments to transfer images of natural objects to paper or cloth. Working with exquisite handcrafted tools, delicate papers, and bright pigments, an artist can easily capture the essence of nature. Subjects such as fishes, plants, feathers, shells, and even rocks can be rendered in amazing detail. Few art forms so simply and precisely capture the subtle distinctions and graceful beauties of nature and certainly no other method I know is so ingenious as to let you feel the designs of nature while you express and impress the images on paper or cloth.

In ancient China, the art form referred to as *T'a-pen* developed hand in hand with the invention of paper. Used to capture characters and figures incised in stone, bone, or metal, these rubbing techniques may have been employed as early as 300 B.C. Stone rubbings appeared in books published in China as early as 1200 A.D. Pictorial stone carvings were often made in China for the sole purpose of being reproduced by rubbing.

In this method, now termed the "indirect" or "wet rubbing" method, a moist sheet of long-fiber paper is molded over and forced into the surface relief of an engraved stone by means of a stiff brush. As the paper dries, black sumi ink is rubbed or dabbed evenly onto the paper by means of tampos or daubers made of silk wrapped around a ball of cotton. When dry, the paper is carefully removed and an indelible image of the stone's relief remains. For storage or presentation the paper must be flattened and mounted on a piece of backing paper.

The value of this technique is obvious. Inexpensive, easily transported, permanent records can be produced of engraved surfaces of any sort. Although often replaced today by photography, rubbings still give the most accurate and detailed reproductions of relief surfaces, sometimes providing details that are not even visible to the naked eye. Calligraphers still study the carved seals and scripts of the ancient masters in this fashion. Modern day anthropologists use stone rubings to preserve and study not only primitive petroglyphs but the elaborate and often elegant relief carvings on temples and monuments. Museums often employ rubbings to display rare and delicate objects in their collections. In Japan, simple stone rubbing techniques are widely used in the popular art form known as *Bokutaku*. Using similar techniques, California artist Elena Orsini creates abstract impressions of glacier scoured rock surfaces in Yosemite National Park.

The "indirect" method shows up outside the Orient in the "dry rubbings" of monumental brasses and gravestones. "Dry rubbing" techniques are much less complicated and time consuming than the oriental "wet rubbing" techniques. A sheet of paper is taped in place over the surface of the object to be recorded and then rubbed with charcoal, crayons, or rubbing waxes to record details of the surface relief. Brass rubbing flourished in England in the 1500s and then all but disappeared until its recent revival in the mid 1900s. During the past 20 to 30 years gravestone rubbing has become increasingly popular in the United States, especially New England. In part this is due to renewed interest in geneology. Anyone interested in tracing their family tree can easily produce tangible records of their ancestry through rubbings. Historians have taken advantage of "dry rubbing" techniques to study colonial symbolism on New England gravestones, and costume designers often use brass rubbings as references when studying clothing of the medieval period.

A direct extension of the ancient Chinese stone rubbing techniques led to the Japanese art form known as *Gyotaku* or "fish rubbing." There are many versions of where, when, and how the Japanese first applied the "indirect" method to fishes. The oldest known prints were commissioned in 1862 by Lord Sakai in the Yamagata Prefecture to preserve the memory of a record fish catch. Throughout Japan today fishermen proudly display prints of trophy catches, and fishing tackle shops fly fish print banners to advertise their wares. Scientists who study fishes often use fish prints to study scale patterns or to calculate surface–volume ratios.

The basic "wet rubbing" techniques have been greatly refined by the Japanese and elevated to a highly sophisticated art form. The use of color combined with the delicate detail that can be achieved with the "indirect" method result in exquisite prints of almost photographic quality. The success of fish printing in Japan depends in large part on the materials available, especially the soft but durable handmade papers and the fine sumi inks. But it also resides in the temperament of the Japanese artists. The aesthetics and patient attention to detail are reminiscent of those of early Japanese woodblock artists such as Hiroshige and Hokusai.

Several pieces from the 1950s by Yoshio Hiyama and his American student, Janet Canning, illustrate the early style. These prints, simple and delicate in appearance, were most often done in black ink. When compared with the brilliant colored contemporary Japanese fish prints, it is possible to appreciate the rapid development and refinement of the techniques which have taken place over the last 30 years. Hiyama has been a leader in developing and promoting fish printing in Japan and throughout the world. In 1955 he helped organize the *Gyotaku-no-kai*, a society for fish printing enthusiasts that currently boasts a membership of over 500 fish printers. In July of each year the society sponsors an annual exhibition of members' prints in a downtown Tokyo department store.

In Europe and the west, an entirely distinct style of nature printing developed in which objects, especially plants, were printed by the "direct" method. In this method pigments are applied directly to the surface of the object by brayers or brushes. Once the surface is completely coated, a piece of soft absorbent paper is carefully lowered on the inked specimen. By gently pressing or rubbing the paper by hand against the surface of the specimen, the ink is transferred to the paper and a mirror image is produced.

The earliest known plant prints are found in a 15th Century manuscript by the German physician, Conrad von Butzenbach. No less an artist than Leonardo di Vinci included a sage leaf illustration along with notes on the plant printing process in his *Codex Atlanticus*. The first crude images were produced by holding a leaf over a candle and coating it with lampblack. The blackened leaf was then placed between sheets of soft paper and rubbed with a smoothing bone to transfer the soot to the paper.

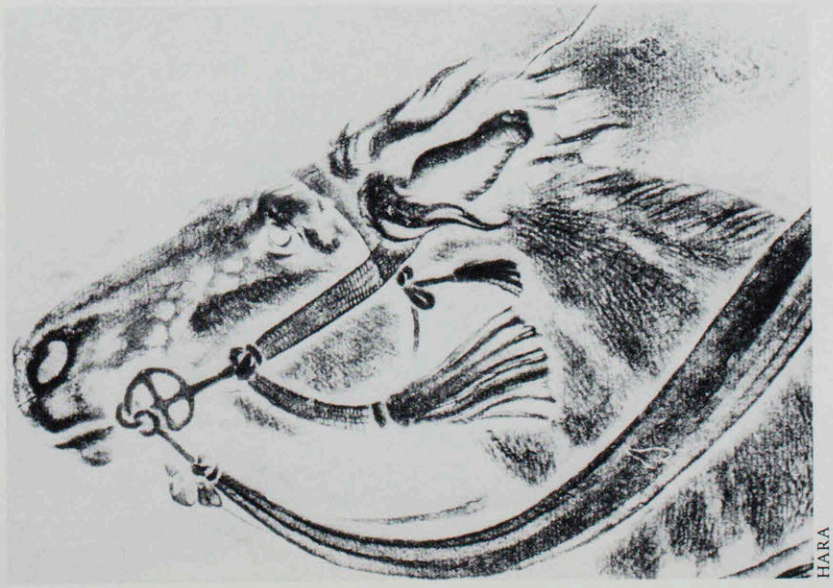
Renaissance physicians, pharmacists, and herbalists needed detailed images of the medicinal plants and herbs that were useful in healing. From primitive beginnings the plant printing process was continually refined over several hundred years. Colored pigments were introduced, and the flat press was eventually employed to make the impressions. The fidelity of detail in many of the herbals of the seventeenth through the nineteenth centuries is unsurpassed even today. But these methods had their drawbacks because a single leaf could be used to produce only a few prints. Eventually a technique was developed in which the leaf or plant to be printed was pressed into a soft lead plate. This was then molded in an electrolytic bath to produce a copper plate. A second electrotype plate was finally reproduced from which a large number of images could be printed.

Two leading European printmakers, Alois Auer of Vienna and Henry Bradbury of London, vied for the patent of the electroplate process. Bitter arguments erupted in the 1850s, but despite the controversy, both men continued to refine techniques and both extracted the maximum results out of the "direct" printing process. Several impressive books were published during this period containing stunning images of algae, ferns, leaves, flowers, lace, snake skins, bats, and even meteorites and polished agates. In the long run, however, it proved too costly to illustrate books with nature prints and eventually the techniques were replaced

Hand prints used by an Indian artist as the principal pictographic elements in a cave in central California. Photograph by K. Conti.

Below, left: Detail of head from Chinese rubbing of stampeding horses. A print in the indirect method by an unknown artist.

Below, right: German anthropologist Dietrich Evans employed indirect stone rubbing techniques to record these unusual petroglyphs in the Swiss Alps.



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by other printmaking processes and by photography. The golden age of nature printing was past and would not be revived in Europe.

Though nature printing was introduced into America in the colonial era it was slow to catch on here. Plant prints by Francis Pastorius, the founder of Germantown, were used in a book as early as 1710. Many colonial botanists such as Jane Colden of New York and Joseph Breintnal of Philadelphia illustrated regional floras with nature prints done in the "direct" method. Even the renowned printer, Benjamin Franklin, used prints of leaves on paper money to prevent counterfeiting in the mid 1700s. Newspapers of the day often carried ads offering to produce black or colored prints for anyone sending in a plant. However, by the late 1700s nature printing had died out and would not reappear until the 1930s, more than 150 years later.

In the last 50 years there has been a remarkable resurgence of interest in nature printing in the United States. Working in isolation, most printmakers in the United States developed their own variations on the "direct" techniques. David Marx first began printing plants in the 1930s. His clear, crisp, readily identifiable images of leaves were reproduced after his death in several books on American shrubs and trees. Ida Geary has written a number of articles on nature printing and used her plant prints to illustrate a large herbal on plants of northern California. The works of both artists are very reminiscent of the early European herbals. The dean of American plant printers, Robert Little, has produced a stream of students emulating his distinct and creative style. A retired botanist, Little's prints reflect a deep understanding and appreciation of plants.

The late Janet Canning is thought to have been the first fish printer outside Japan. Canning, a scientific illustrator at the American Museum in New York, was tutored in nature printing techniques by Yoshio Hiyama in the late 1940s and early 1950s. Her style, like that of the Japanese fish printers of the time, was simple and delicate. The soft, ethereal images of contemporary California fish printers Cathy Engel and Chris Dewees are also reminiscent of early Japanese prints. In striking contrast are the bold images of Connecticut artist Robert Cale. Remarkable for the intensity of color and composition, they reflect a new and very different style. Employing techniques developed as an artist and master printmaker, Cale utilizes brayers to apply viscous inks to his subjects, and then pulls prints on heavy European etching papers.

As a scientist I find that nature printing combines a delightful blend of art and nature. Working with either plants

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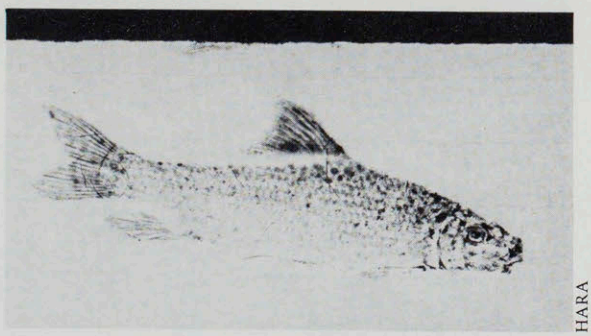
Using ancient stone rubbing techniques, California artist Elena Orsini creates modern Landscape *abstractions from glacier scoured granite outcrops in Yosemite National Park.*

Below: Indirect print of a Sucker *done in the early 1950s by Janet Canning, the first American fish printer. Canning was instrumental in organizing an exhibit of Japanese fish prints at the American Museum in 1956.*



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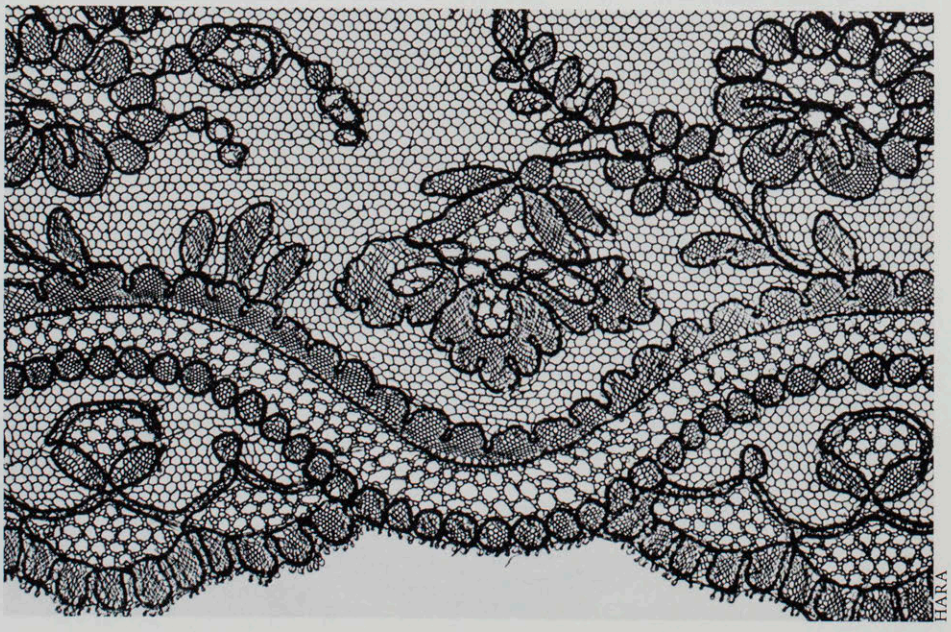
Under the direction of Alois Auer objects such as English lace, leaves, and snake skins were impressed in soft lead plates and used to illustrate a portfolio of nature prints produced in 1853 by the Imperial and Royal Court and State Press in Vienna.



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The earliest plant prints known are found in the journal of Austrian physician Conrad von Butzbach. They were printed by the direct method while he was on a journey to Italy in 1425.

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The sophistication of Japanese techniques is clearly evident in this recent indirect print of Stone Flounder and Crabs *by Gyotaku Syuko Ochiai.*

or fishes, I can capture images with a variety of techniques. Through teaching I have found that for people with time on their hands nature printing provides a refreshing outlet for creative expression. There is a timeless joy in using one's hands to touch and explore the delicate contours of nature while at the same time creating images on paper. With a little practice the techniques can be mastered, and in short order striking prints can be produced for display, sale, or as gifts. In fact, the renewed popularity of nature printing is principally due to the simplicity of the "direct" printing techniques combined with the accessibility of subjects. A tangible contact with nature that is all important to our lives combined with an "instant" art form results in immediate satisfaction for young and old alike.

Dr. Hochberg is Curator of the Invertebrate Zoology Department at the Santa Barbara Museum of Natural History. His research interests include studies on cephalopods, parasites of marine animals, and terrestrial invertebrates of the California Islands.

A co-founder of the Nature Printing Society, Dr. Hochberg helped organize and coordinate the exhibit Pressed on Paper currently being toured by the Smithsonian Institution Traveling Exhibition Service. In addition to being an exhibitor in the Smithsonian show, he has had a number of one-man shows of his fish and plant prints. He has worked with all the major nature printers in North America and teaches workshops on nature printing around the country.

For museum members and others who are interested in the art of Gyotaku or fish printing, the Education Division will be offering a 1-day workshop with Dr. Hochberg in October. For further information, call the Education Division at 213/744-3341.

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A nature print of a delicate red alga illustrates the title page of a book on seaweeds. The four volume set of books was printed in 1859 in London by Henry Bradbury.

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Rock Fern *printed in 1980 by Pennsylvania artist Renata Sawyer. Printed in the direct method on soft Japanese handmade paper, the print is a study of the plant's morphology and growth habit.*

Page 27: Details of the delicate Goat's Beard *are captured in direct print by California artist F. G. Hochberg. In a process that occupied most of a day, each flyaway seed was individually inked and positioned to give the impression of the wind breaking up the head of this large dandelion relative.*

Below: Connecticut artist Robert Cale assembled 40 flatfish to produce this striking Orange and Blue Group. *Oil based inks were applied directly to the fishes and rubbed onto a large sheet of etching paper.*

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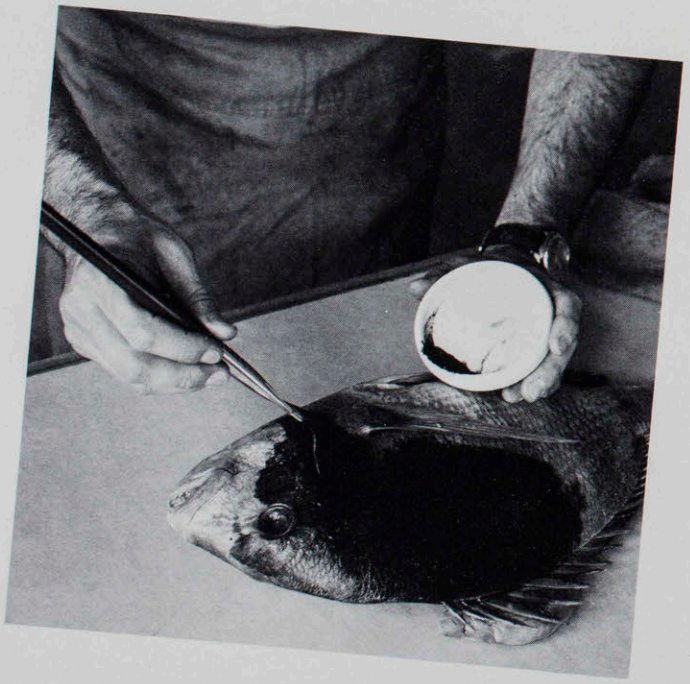
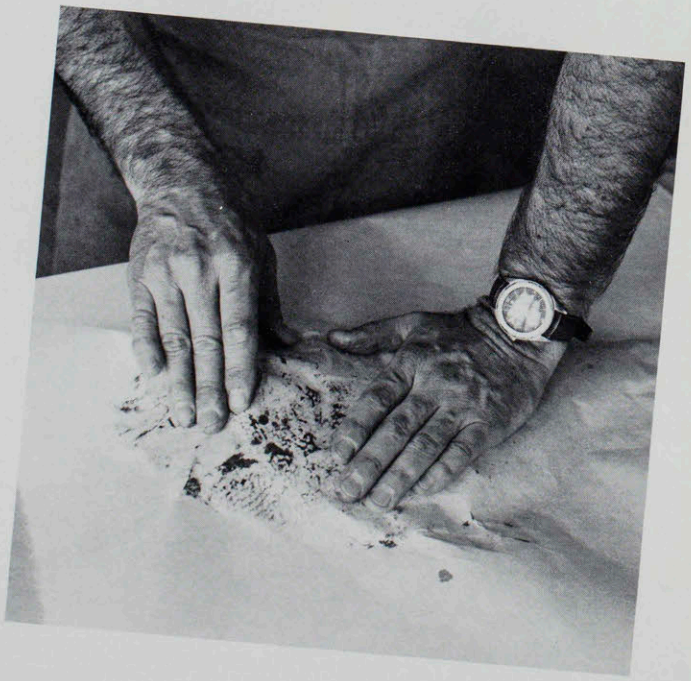
Creating a Fish Print, Step by Step

Photographs by HARA

Nature printers use inks or pigments to capture the elegant and intricate forms of fishes on paper or cloth. To prepare a fish for printing, select one that is fresh and undamaged. Wash to remove mucus and blot dry with paper towels. Plug the mouth, gills, and anus with wads of paper toweling to absorb blood and other fluids. Place in the desired position.



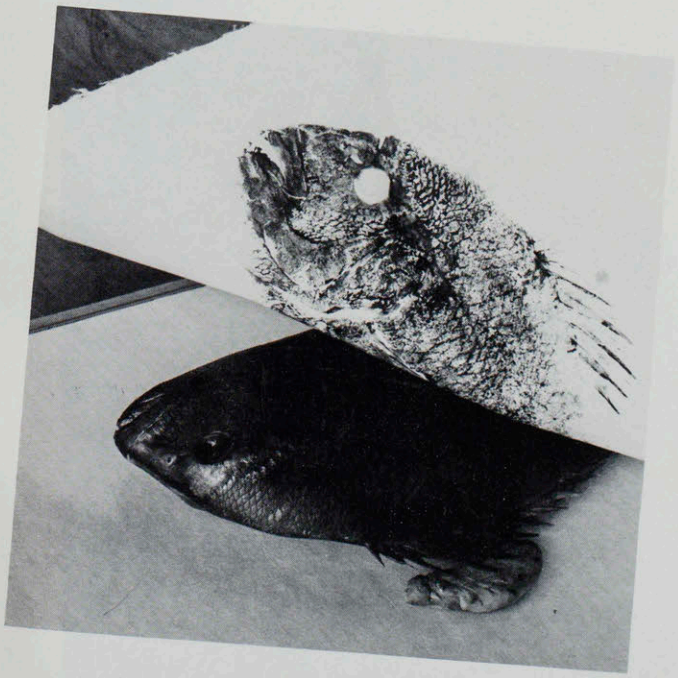
In the **Direct Method** of American printmakers, ink is applied to the surface of a fish with a brush.



A sheet of soft, absorbent paper is lowered onto the inked specimen and rubbed gently by hand. Take care not to smear the ink or move the paper while rubbing.

Two principal methods of printing can be employed. With the **Indirect Method**, which is practiced by Japanese artists, a moistened sheet of long-fiber handmade paper is molded over the surface of the fish.

Ink is applied to tampos made of silk or thin fabric wrapped around a ball of cotton. As the paper dries, ink is rubbed evenly onto the paper covering the fish. When finished, carefully lift the paper off the fish to view the image.

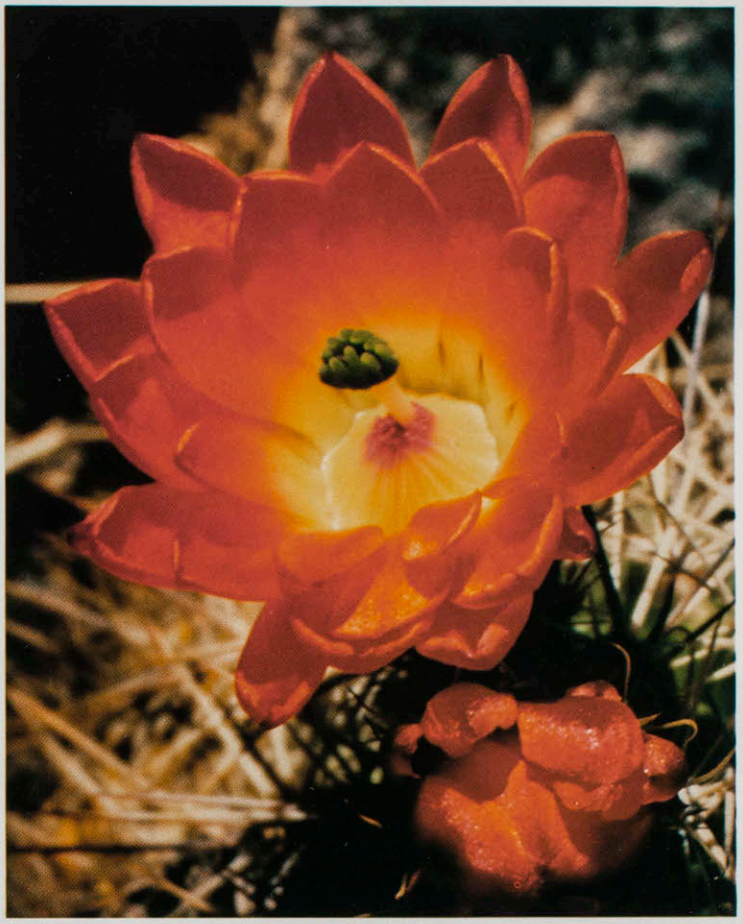


In the process of rubbing the ink is transferred to the paper and when removed a mirror image is revealed.

In both methods, after the ink dries, paint in the eye by hand using a small brush. Flatten or mount your signed and dated print and be sure to identify the fish.

CACTI & SUCCULENTS:

A Photography Exhibit at the Natural History Museum

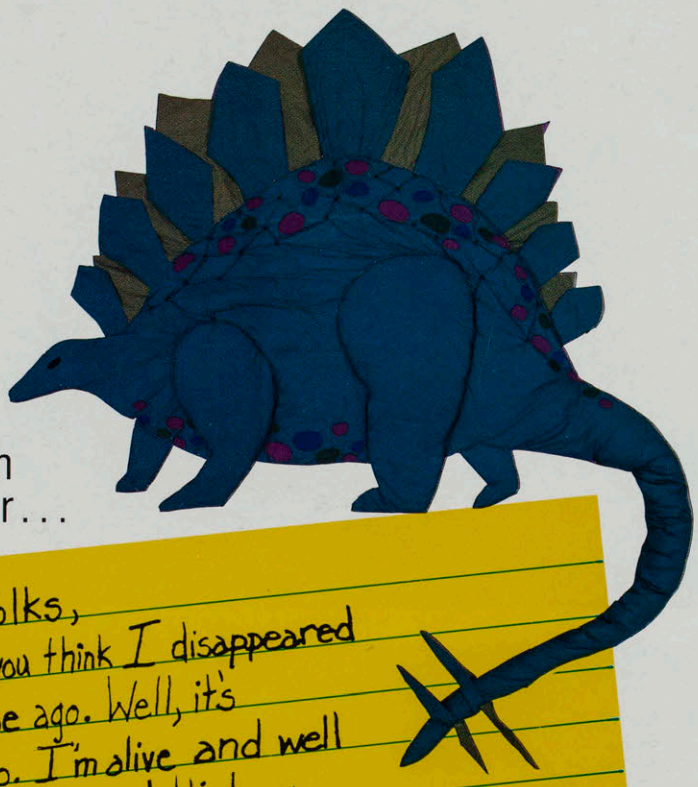


Cacti and Succulents of West Texas, a series of color photographs by Clark Champie, will be on display in the ground floor Changing Gallery from November 6, 1984, through February 4, 1985. Mr. Champie has been studying and photographing the cacti and succulents of West Texas, with particular emphasis on those found in the Franklin Mountains near El Paso, for over 20 years. The exhibit is a remarkable documentation of the succulent flora of this area. Mr. Champie has published two books, *Strangers in the Franklins* and *Cacti and Succulents of El Paso*, that utilize many of the photographs that will be on display. His books will be available in the museum's new Book Store.

Mr. Champie is currently studying and photographing geotropism (bending toward the earth) in Yucca plants.

Kids, parents, teachers, and friends:
There's a fun new place to visit
and enjoy . . .

THE DINOSAUR SHOP



An open
letter from
a dinosaur . . .

Dear Folks,
Some of you think I disappeared a long time ago. Well, it's just not so. I'm alive and well at the Natural History Museum's new DINOSAUR SHOP.

I'll greet you at the entrance on a bright new banner. Inside you'll find all sorts of books and games which will tell you about my fascinating life story.

Now that it's back-to-school time, be sure to visit me. Your school days will be more fun when I can keep you company on T-shirts, erasers, and rulers. Dinosaur days are here again!

Signed, Stanley
Stanley the Stegosaurus

THE DINOSAUR SHOP
Natural History Museum • 900 Exposition Blvd. • Los Angeles, Calif. 90007

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